Metals Review

September 1957

Francis F. Lucas
One of the Ten
(See Article, Page 4)

Metals Review

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Important Lectures

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One of the Ten . . . . .

Imagine a rowboat with ten persons in it, about to sink. Which ten specialists in the world of science would be missed most sorely if they were not able to continue their contributions to science if the rowboat were to sink?

According to a survey conducted by E. E. Free for the North American Review in 1930 ("Who Are the Greatest in Science?"), Francis F. Lucas of the Bell Telephone Laboratories would be one of the ten.

In a novel method of selecting his key figures, Dr. Free chose those whose sudden passing he felt would be an almost irreparable loss . . . which ten, if we lost them, would most seriously alter the future course of science by the mere fact of their absence?

In the matter of cancer research, because it seems to touch so closely on the very mature of life, there is a man, according to Dr. Free, who "he would steal instanter, if he hated mankind". He is a metallurgist, but he has perfected the most powerful microscopic equipment in the world. He is Francis F. Lucas.

Authority in Microscopy

Dr. Lucas is recognized as an outstanding authority in microscopy, metallography and the structure of materials and matter. He was a pioneer in the development of high-power photography of metallurgical specimens and for this initial work the American Society for Metals awarded him the Henry Marion Howe Gold Medal (1924). He is known for his work with the ultraviolet microscope which originally was developed for biological investigations. It did not prove to be a success, however, until Dr. Lucas developed a technique, called optical sectioning, which made it possible for living cells to be photographed on 20 or more planes, from top to bottom, and made the ultra-violet microscope one of the most powerful tools in the world for the study of living cells. In collaboration with other authorities, Dr. Lucas applied his technique to the study of benign and malignant tumors and their cure and, for several years, he served as scientific advisory trustee of the Cancer Research Division of the Donner Foundation Inc. in Philadelphia.

A Teacher of Teachers

Dr. Lucas was born in Glen Falls, N. Y., 72 years ago and started his career at the age of 17 climbing telephone poles for the Bell System. Several times during his life he started taking college courses toward that degree he was not able to get at West Point because of bad eyesight. . . . lack of funds being a major deterrent in his reaching this goal. But, in spite of his failure to obtain a professional degree, he always seemed to end up teaching the teacher; many of his reports on scientific research are used today in colleges throughout the country. In 1931 Lehigh University conferred on him an Honorary Doctor of Science.

Dr. Lucas was associated with Bell Telephone Companies from 1902 until 1949, and with the Watertown Arsenal, U. S. War Department, from 1928 to 1936. He was a delegate to the International Congress for Testing Materials at Amsterdam, Holland, in 1927, and at Zurich, Switzerland, in 1931. In 1929 he was sent to the World Engineering Congress at Tokyo. From 1942 to 1950 he served as a member and finally president of the East Orange, N. J., board of fire commissioners and, in cooperation with the American LaFrance Co., developed and improved fire-fighting equipment.

Dr. Lucas, in whose name the first Francis F. Lucas Award for Excellence in Metallography will be awarded during the National Metal Congress and Exposition in Chicago in November, is now retired from business. He divides his time between his home at 1848 Mizell Ave. in Winter Park, Fla., and his home at Lake George, N. Y. His hobbies include archaeology and history . . . he is collecting material for a book he hopes to write someday; he enjoys the symphony, does oil painting, fishing and he still takes pictures, having recently ventured into the world of underwater photography.

He was refused admittance to West Point because of bad eyesight, yet his eyes and his genius combined let him see things way beyond the average man. Over a period of 47 years he made contributions to science and medicine . . . . contributions which brought him international fame.

Dr. Lucas has twice received the medal of the Royal Photographic Society of Great Britain and has been awarded the John Price Wetherill Medal of the Franklin Institute of Philadelphia. He is an honorary consultant in history, science and technology in the erection and restoration of Fort William Henry at Lake George, N. Y.

Praise for His Partner

Although the many, many honors he has received have come directly to him, Dr. Lucas credits his wife, Rose Jennet Howe, also of Glen Falls, N. Y., with a large part of his success story. It was she who agreed to the purchase of the first microscope on a very limited budget . . . it was she who gave up her kitchen for the study of metallurgy. Later this work was relegated to the cellar and instead of a recreation room, a $100,000 research laboratory was designed and constructed . . . a laboratory where he worked nights and weekends to make contributions to science that made him worthy of a listing in Who's Who of America, and a place in that lifeboat as one of the ten men the world would miss most dearly if he were taken away.

TECHNICAL PROGRAMS

39th National Metal Congress

and

2nd World Metallurgical Congress

The complete technical programs of the American Society for Metals, the 2nd World Metallurgical Congress and all participating societies will appear in the October issues of METAL PROGRESS and METAL SHOWMAN, both of which will be sent to the total membership of the American Society for Metals, and Conferees in the W.M.C., well before the Congresses convene in Chicago in November.

A.S.M. Continues To Grow—
Adds Men To Headquarters Staff

Several additions to the headquarters staff of the American Society for Metals offer testimony to the fact that the A.S.M. has not stopped growing. Over the past few months the following additions, or changes, have been made.

Howard E. Boyer

Howard E. Boyer, formerly chief metallurgist, American Bosch, has been appointed managing editor of the *Metals Handbook.* His primary concern will be with the organization and operation of Handbook authors committees. Howard has served as chief metallurgist for American Bosch for the past 18 years, and with Cooper-Bessemer Corp. prior to that. He is a graduate of Ohio State University.

Over a period of years Howard has taken an active part in a number of technical societies, being on the speakers' list for both A.S.M. and A.S.T.M., and for many years he has been a member of A.S.M.'s national nominating committee. He has held several offices, including that of chairman of the Springfield Chapter.

H. E. Boyer

Howard is the author of over 80 papers and articles relating to the metalworking industry, some of which have been presented at National Metal Congresses, and many of them have appeared in trade journals in the United States, Sweden, England and France.

Joseph E. Foster

Joseph E. Foster, formerly assistant to the technical director of the American Foundrymen's Society, has been appointed associate editor of the *Metals Handbook.* Before joining A.F.S. in 1946 Joe had been on the technical staffs at International Harvester Co., the Rock Island Arsenal, Western Cartridge Co. and Dodge Chicago. He is a graduate metallurgical engineer, having received his degree from University of Illinois.

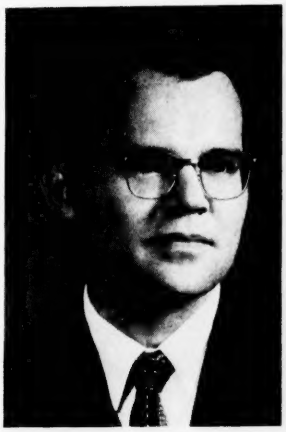
J. E. Foster

James J. Kubbs

James J. Kubbs comes from his position as chief metallurgist, Jeffrey Manufacturing Co., Columbus, to join the staff of the *Metals Handbook* as associate editor. Before joining Jeffrey in 1950, Jim was connected with National Smelting Co., Vlchek Tool Co. and Modern Steel Treating Co. He holds a B.S. degree in metallurgical engineering from Fenn College.

Fred L. Siegrist

Fred L. Siegrist, formerly Alcoa staff metallurgist, has been appointed training supervisor for the rapidly growing A.S.M. Metals Engineering Institute. Fred comes to A.S.M. after ten years experience in diversified metallurgical operations, including testing and evaluating high-temperature alloys for turbo-prop, turbo-jet and ram-jet engine applications at Wright Aeronautical. He was also associated with Westinghouse in research and development of nuclear reactor components, particularly the development and fabricating techniques for zirconium and titanium. At Aluminum Co. of America Fred was concerned with development work and quality control of extrusions.



F. L. Siegrist

He received his engineering degree from the University of Illinois where he graduated with honors, and later served in the U. S. Air Corps as a weather observer.

Paul Hancy

Paul Hancy has been assigned as advertising assistant in the sales department of *Metal Progress.* Paul, 24 years old, is married and lives in Berea, Ohio. A Korean veteran, U. S. Signal Corps, Paul is a graduate of Dyke and Spencerian College where he majored in advertising and selling and business administration.

J. J. Kubbs

John Parina

John Parina, formerly associate editor of the *Metals Handbook,* has been promoted to the editorship of A.S.M.'s technical books department.

William J. Carnes

Bill Carnes, formerly a commercial photographer for Parade Studios Inc., has joined the Metal Show staff, working under Chester L. Wells, assistant managing director of the National Metal Exposition.

Columbus Executive Committee Meets

Shown at the Executive Committee Meeting Held by the Columbus Chapter Are, From Left: C. C. (Jim) Hoffman, Timken Roller Bearing Co.; Gerry O'Kane, Ternstedt Division, General Motors Corp.; Bob Moreen, North American Aviation, Inc.; Treasurer John G. Kura, Battelle Memorial Institute; Chairman Gerry Wood, North American Aviation, Inc.; Vice-Chairman Tom Chase, Electric Heat Treating Co.; and Secretary R. E. Christin, Electric Heat Treating Co. (Reported by R. E. Christin, Columbus)

Detroit Old-Timers Hear Review of Gear Metallurgy

Speaker: Harry B. Knowlton

Armour Research Foundation

At a meeting of the **Detroit Chapter,** Harry B. Knowlton, research metallurgist, Armour Research Foundation, spoke on "Induction and Case Hardened Gears and Gear Steels".

As this meeting was held to honor the old timers of the Detroit Chapter, Mr. Knowlton's review of the past 45 years of gear metallurgy was very appropriate. He stated that at the time he finished college, comparatively little was known about gear metallurgy. When he started on his job in Elmira, N. Y., he knew nothing about gears or their heat treatment, but had a slight advantage over the old heat treat foreman who knew so many things which were wrong. In the intervening years much time and money has been spent in obtaining facts dispelling many of the fetishes associated with gear metallurgy. Some of the points discussed were as follows:

1. The most common misconception was that a good case hardened gear must have a hard case and a soft tough core. At present it is recognized that the case must be both hard and tough and that preferably there should be compressive stresses at the surface. Hardening of the core may affect surface stresses.

2. It was thought that a good gear must be contour hardened, that is, the bottom of the case must be parallel with the surface of the gear tooth.

3. Impact testing was over-emphasized during the early development of gear metallurgy.

In the early days, the criteria for a good gear were a file hard surface and an ability to withstand a sledge hammer blow without breaking the tooth. The accepted method for case hardening consisted in carburizing and double quenching. Later testing proved that a gear with better physical properties could be produced by using a fine-grain steel, carburizing, and single quenching from the carburizing temperature.

The development of the induction hardened gear was reviewed. Slides were employed to emphasize the salient points. Case histories of both good and bad performance of induction hardened and case hardened gears in the field and on dynamometer tests were discussed. In some cases gear teeth were hardened through almost to the root, without loss of serviceability, while in other instances teeth with almost identical cross-sectional hardness patterns could be very easily broken. The difference in properties was due to the method of heat treating and the type of residual stresses produced. Compressive stresses on the surface raise the fatigue strength while tensile stresses decrease it.

Emphasis was placed on the need for more scientific study of stress distribution during the heat treatment of gears.

The five major ways in which gear failures occur were listed as follows: abrasive wear; bending fatigue (root line); pitting; bending failure from pitted area; and subsurface failure due to hardness strength at some point on the cross section being lower than the stress occurring at that point.

Boron steels were reviewed. The major effect of boron was to increase the hardenability of the core. On the other hand, boron had much less effect on case properties, which made the boron steels undesirable for certain large gears. Increased core hardenability produced prohibitive distortion of some small gears. In many instances induction hardened carbon steel gears compared favorably with case hardened alloy steel gears on the dynamometer tests.

Emphasis was placed on the need for continued research studies and improved methods of testing. Among the subjects needing further study may be mentioned: effect of composition, hardness and structure on brittleness of carburized and hardened cases; rolling-crushing-fatigue properties and their relation to pitting near the surface; cause and prevention of deep subsurface failures; hardenability curves for all carbon contents from case to core for different types of alloy steels; measurement of residual stresses; and specific effect of different alloying elements.—**Reported by A. E. Gurley for Detroit.**

Rhode Islanders Enjoy Dinner-Dance

Shown at the Annual Dinner Dance Held by the Rhode Island Chapter Are, From Left: Sidney Siegel, Chairman, and Mrs. Siegel; and Mrs. and Mr. William Matthew, Vice-Chairman. (Report by M. C. Battey for Rhode Island)

Arlington State To Offer Metallurgy Course

Shown at a Meeting Held Recently by the Officers and Executive Committee of the North Texas Chapter With Representatives From Arlington State College, Are, Standing, From Left: Maurice Condon; John Mitchell, Committeeman; G. E. Smith, Head of the Department of Engineering at Arlington State College; Perry Glenn, Committeeman; Stephen Maszy, Treasurer; Robert Dilbeck, Committeeman; and C. E. Perkins, Vice-Chairman. Seated are, from left: E. H. Ford, Department of Engineering, Arlington State College; J. P. Fowler, past-chairman; Albert S. Holbert, present chairman; and Irving C. Comroe, who is committeeman-at-large.

The Arlington State College will offer for the first time in its evening program a course in "Basic Metallurgy" starting with the fall semester in September. G. E. Smith, head of the department of engineering at Arlington, made this announcement during a meeting with the officers and executive committee of the **North Texas Chapter** held recently.

Prof. Smith pointed out that the course will be open without prerequisite to first year students of Arlington State, as well as others who are interested in acquiring a broader knowledge of this comparatively new science of the metals industry. The course is being offered in response to popular demand by the metal industry in the rapidly expanding Fort Worth-Dallas area. The same course is offered in the day program.

Regarding efforts of citizens in this area aimed at elevation of Arlington State to a four-year college status, Prof. Smith stated that such action as is needed would be a function of State Legislation. He explained a few of the many factors to be considered in such a movement.

He was informed by the group that the North Texas Chapter is 100% in favor of such legislation and would put forth every effort as an organization toward gaining such a status for the school.

—Metal . . . the Link Between Today and Tomorrow—

Carbon and Alloy Steels Discussed at Rocky Mountain Chapter Meeting

Speaker: J. A. Whitehead

Crucible Steel Co. of America

John A. Whitehead, product service engineer, Crucible Steel Co. of America, presented a talk entitled "Effective Selection and Fabrication of Carbon and Alloy Steel" at a meeting of the **Rocky Mountain Chapter.**

Mechanical factors that are important in the selection of either carbon or alloy steels include: make adequate allowance for surface removal before heat treatment, removing decarb, mill surface, etc.; avoid sharp changes in cross section, notches and corners; where abrupt changes in cross section are unavoidable, use generous fillets; use the best possible finish; be sure part is large enough for the required stiffness; be sure the strength-weight ratio is correct; avoid corrosion pockets.

Assuming that proper design has been taken care of, the properties needed for best performance must be considered, particularly strength and ductility. These properties can ordinarily be satisfied by the proper choice of steel and the correct heat treatment. Other performance considerations include such things as very high or low operating temperatures.

Fabrication requirements are also important. These include: machinability and type of machine involved (is quality or quantity more important?); torch cutting or welding (will pre or post heating be required?); cold or hot forming characteristics.

Mr. Whitehead cited some general rules to aid in choosing between carbon and alloy steels. Use carbon steel, he suggested, if the part is not over ¾ in. at the thickest section; if no particular notch resistance, strength or ductility are required from subzero to 100° F.; if required strength can be procured by cold drawing or cold rolling; if very heavy sections are involved, say 10 to 20 in. or more in thickness, requiring a maximum tensile strength of only 75,000 psi. with corresponding yield, elongation and reduction of area.

The speaker suggested that alloy steel be used if parts over ¾ in. thick require uniform strength in cross section after heat treating; if the greatest ductility and impact strength are required at any given level of strength or hardness; or if the greatest wear resistance or combination of wear resistance and core strength are required.—**Reported by V. D. Heinze for Rocky Mountain.**

—The Future is Reflected in Metals—

Speaker Available

The Kolene Corp., 12890 Westwood Ave., Detroit 23, Mich., has an excellent talk on the "Descaling of Titanium", with slides, that is available for presentation before A.S.M. Chapters and other groups. Interested program chairmen should write to the company for information.

Metallurgical News and Developments

Devoted to News in the Metals Field of Special Interest to Students and Others

A Department of *Metals Review*, published by the American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio

To Subdivide—Kaiser Aluminum & Chemical Corp. is dividing its aluminum operations into five major divisions, each under a general manager, as follows: Metals, Industrial, Electrical Conductor, Products, and Overseas Divisions.

Grinding Wheel Course—A five-session program on "Grinding Wheels" will be presented at Carnegie Tech by the Pittsburgh Section A.S.T.E. First meeting will be on Oct. 7. Contact: Walter E. Baker, Jr., Chairman, Educational Committee, c/o Universal Cyclops Steel Corp., 507 Grant Bldg., Pittsburgh 19.

K-Factor Tester—Tatnall Measuring Systems Co has developed a K-Factor Tester to measure the specific thermal conductivity of a material which is quick and easy to use and low in cost.

Metals Engineering—The fall meeting of the American Society of Mechanical Engineers, to be held Sept. 23-25, 1957, at the Hotel Statler in Hartford, Conn., will include five sessions on metals engineering. Complete program is obtainable through: L. S. Dennegar, A.S.M.E., 29 W. 39th St., New York 18.

Engineering Conference—The 1958 College-Industry Conference on the Relations With Industry Division of the American Society for Engineering Education will be held at the University of Michigan Jan. 30-31, 1958. Approximately 500 representatives of industry and education will discuss industry's needs for and utilization of well-educated and motivated technical personnel and also the changes being forced on education by pressures from industry and population growth.

Expansion Announced — Alloy Precision Castings Co. has announced plans to build an addition to its present facilities which will double production space and sizeably increase laboratory and development engineering facilities.

Special Meeting—The Iron and Steel Institute, London, is holding a special meeting in Belgium and Luxembourg from June 18-28, 1958, on the general theme, "New Developments in Iron and Steelmaking". Sessions will include papers on: The Bottom-Blown Converter; Top-Blown Oxygen Processes; Steelmaking in the Open-hearth Furnace; Large Arc Furnaces; Low-Shaft Furnaces; New Direct Processes; Blast-Furnace Burden Preparation; New Techniques in Blast-Furnace Operation; Theory of Continuous Casting and Development of Experimental Machines; and Industrial Applications of Continuous Casting.

Thin Nickel—High-nickel alloy strip in thicknesses as low as 0.0005 in. and tolerances as close as ± 0.0001 in. has been developed by American Silver Co. to meet miniaturization requirements in the aviation, missile, instrumentation, automation, electronics and electrical industries.

Inhibitor — Enthone, Inc., has announced the development of an inhibtor for use in acid solutions which can be used on high carbon steel without danger of etching.

High-Strength Alloy — A high-strength alloy, X5454, developed specially for welded aluminum structures that must operate at moderately high temperatures, has been announced by Alcoa. It should find extensive use in the process industries where aluminum vessels, storage tanks and piping are required to handle hot chemicals.

Still Growing—A $50-million, 7-year industrial expansion program adding nearly 100,000 tons of annual productive capacity at plants throughout the country has been completed by the National Carbon Co., division of Union Carbide Corp.

Moly Tubing—Bridgeport Brass Co. has announced that its Hunter Douglas Division has produced molybdenum seamless tubing by the cold extrusion method, eliminating many of the difficulties which result from volatile oxide formation in copious quantities above 1300° F. and permitting precision tolerances after only a few press operations.

Super-Steel — Mid-Vac processed steels, melted by a consumable electrode in a vacuum, providing higher physical properties and relatively cleaner steel than is possible by other known processes, have been developed by Midvale-Heppenstall Co.

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Talks on Service Failure at Milwaukee

S. W. Poole, Supervisor of Titanium Research Laboratory, Republic Steel Corp., Who Gave a Talk on "Metallurgical Service Failures" at a Meeting of the Milwaukee Chapter, Discusses a Point With Chapter Representative

Speaker: S. W. Poole
Republic Steel Corp.

S. W. Poole, supervisor of the Titanium Research Laboratory, Republic Steel Corp., presented a talk on "Metallurgical Service Failures" at a meeting held in **Milwaukee.**

Mr. Poole emphasized the benefits to be gained by indoctrinating shop personnel on the importance of eliminating stress concentrators during the fabrication of equipment. Generally, when they understand the problem, a substantial improvement is noted resulting in fewer reworks and failures due to tool marks, scratches, arc strikes, etc.

Notch sensitivity varies with materials and microstructure. Recent work conducted at the Titanium Research Laboratory indicated that the acuity of the notch rather than the flank angle governs the resistance to rupture in titanium. For alloy steels in general, materials having a tempered martensitic structure display the greatest resistance to fatigue, followed by structures containing tempered martensite and bainite and tempered martensite and tempered pearlite. Other materials, such as high-nickel alloys, when exposed to sulphurous atmospheres, crack and fail prematurely. Outside influences that can bring about brittle fracture in steel are (1) an unfavorable stress pattern, (2) decrease in temperature, and (3) the rate of strain.

Fracture surfaces resulting from almost every conceivable type of fatigue failure were shown through the liberal use of slides. Factors such as flaking, residual stress, inclusions, shrinkage c r a c k s, microstructure, etc., were dramatically displayed.—**Reported by Don Kedzie for Milwaukee Chapter.**

CORRECTION

In a report on a meeting of the Western Ontario Chapter which appeared on p. 11 of the July issue, *Metals Review,* J. Cunningham was mentioned as the owner and operator of the Detroit Flame Hardening Co.

Mr. Cunningham is actually the owner and operator of the Flame Heat Treating Co. of Detroit. M. R. Scott is president of the Detroit Flame Hardening Co. The two companies have no connection with each other.

New Films

Steelmaking in Sweden

Uddeholm Co. of America, Inc., 155 E. 44th St., New York 17, N. Y., has announced the availability of a film on modern steelmaking in Sweden. The film takes the viewer on a tour of Uddeholm's plant, following the progress of the ore from pig and sponge iron to steel, and covering Uddeholm's methods of producing billets, strip steel, wire rods, toolsteel bars, stainless steel, seamless tubes, etc. The 16-mm. film runs for 30 min., and can be obtained directly from Uddeholm.

Man in the Doorway

A 16-mm. sound and color film produced by American Cyanamid Co. as a tribute to the chemical industry, portrays the industry's key role in helping America make better use of its resources. The film tells the story through selected Cyanamid operations which are broad enough to illustrate the achievements of the entire industry in developing and improving our present standard of living. The theme of the picture is conservation, with subject matter ranging from agriculture and plastics to the field of health.

Arrangements for showing the film should be made through Miss Norma Anderson, 30 Rockfeller Plaza, New York 20, N. Y.

Reactor Problems Los Alamos Topic

John H. Frye, Jr. (Right), Oak Ridge National Laboratory, Spoke on "Materials Problems in Power Reactors" at a Meeting Held by Los Alamos Chapter. Incoming chairman Fred Schonfeld (left) received the Chapter bell from outgoing chairman W. N. Miner during the meeting. Dr. Frye described a typical solid fuel element reactor and gave a breakdown of unit electric power cost from this source in terms of fabrication, fissionable material, fuel element reprocessing and waste disposal. In principle, the liquid fueled reactor has many advantages economically over one using solid fuel elements. Much work is now in progress to solve certain material problems and to permit the full use of these many advantages

100TH STUDENT ENROLLS IN METALS INSTITUTE

Philip G. Jackson, production materials tester with the Allison Division of General Motors Corp., Indianapolis, Ind., has enrolled as the 100th student of the Metals Engineering Institute, the home study school of the American Society for Metals.

This latest enrollment of the 100th student, coming just a few short weeks since the brief announcement of the first Institute courses, is an amazing recognition of the need for the specialized home study courses on metals, said Dr. Anton de Sales Brasunas, M.E.I. director. It is indicated again how well adapted these courses are to industry's training problems.

In addition to the enrollment of testing and laboratory men, many other titles are represented, including metallurgists, engineers, foremen, chemists, sales executives, and heat treaters.

Moreover, concluded Dr. Brasunas, this early 100-student enrollment comes from a wide geographical area—from New England to the West Coast, and with more than 20 states represented.

Mr. Jackson will take a 15-lesson course in the study of "Elements of Metallurgy", an authoritative introduction to practical metallurgy edited by Ralph E. Edelman, chief, Reactive Metals Section, Pitman-Dunn Laboratories, Frankford Arsenal, Philadelphia.

While three home study courses are ready at the present time, at least nine others will follow by the first of the year. Present courses, in addition to "Elements of Metallurgy", are "High-Temperature Metals" and "Heat Treatment of Steel."

Nine courses to be completed by Jan. 1, 1958, include such subjects as Titanium, Oxy-Acetylene Welding, Metals for Nuclear Power, Steel Foundry Practice, Stainless Steels, Gray Iron Foundry Practice, Electroplating and Metal Finishing, Primary and Secondary Recovery of Lead and Zinc, and Steel Plant Processes.

Mail This Coupon for Home Study Course Information
NO OBLIGATION

Metals Engineering Institute
A Division of A.S.M.
7301 Euclid Ave.
Cleveland 3, Ohio

Send me the free complete details on the course, *ready now*, as checked.

I am interested in future courses as checked.

Name ____________

Street and No. ____________

City ________ Zone ____ State ______

Check Your Interest

COURSES READY NOW

- ☐ Elements of Metallurgy
- ☐ High-Temperature Metals
- ☐ Heat Treatment of Steel

Check Your Interest

FUTURE COURSES

(Ready Jan. 1, 1958)

Information on these courses will be mailed as quickly as they are ready.

- ☐ Oxy-Acetylene Welding
- ☐ Titanium
- ☐ Metals for Nuclear Power
- ☐ Steel Foundry Practice
- ☐ Gray Iron Foundry Practice
- ☐ Stainless Steels
- ☐ Electroplating and Metal Finishing
- ☐ Primary and Secondary Recovery of Lead and Zinc
- ☐ Steel Plant Processes

Compliments

To STANLEY M. NORWOOD on his appointment as assistant to the president of Electro Metallurgical Co. Mr. Norwood, a member of New York Chapter, will continue as vice-president of this Division of Union Carbide Corp.

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To WILLIAM G. PFANN, metallurgical research department, Bell Telephone Laboratories, who will be awarded the Francis J. Clamer Medal of The Franklin Institute "in recognition of his discovery and application of zone refining to metals and other crystalline substances" at the Institute's annual Medal Day ceremonies to be held in Philadelphia on Oct. 16. Mr. Pfann is a member of the New Jersey Chapter.

To A. F. SPRANKLE, on his appointment as technical director and vice-president of Vanadium Corp. of America. He will have charge of the Research Center in Cambridge, Ohio.

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To MORRIS A. STEINBERG, on the write-up he received in *Unfolding Horizons*, staff organ of Horizons Inc. Dr. Steinberg is head of the metallurgy department.

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To F. L. LAQUE, vice-president and manager, development and research division, International Nickel Co., on his election as vice-president A.S.T.M. for a two-year term, and to CLAUDE L. CLARK, metallurgical engineer, Timken Roller Bearing Co., on his election as director A.S.T.M. for a three-year term.

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To DONALD E. MACKNIGHT, senior in metallurgical engineering, Montana School of Mines, on being awarded the $1000 Mary W. Young Westervelt Fund loan for the coming school year. The grant is one of 16 awards presented by the Woman's Auxiliary to the A.I.M.E. to students in all parts of the United States. One-half of the loan is repayable at his convenience while the other half does not have to be repaid.

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To DAVID V. RAGONE, assistant professor of metallurgical engineering, University of Michigan, who was chosen to receive the Engineering Society of Detroit's 1957 award as "an outstanding young engineer". He was cited for his activities as a teacher, researcher and administrator. He was also named by the national chemistry honor society, Phi Lambda Upsilon, as the "outstanding teacher of 1957".

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To GWILYM PRICE, chairman and president of the Westinghouse Electric Corp., who was chosen as one of 11 successful American business and professional leaders to receive the annual Horatio Alger Award. The awards are dedicated to the free enterprise system and the American tradition of equal opportunity which enabled a youth to overcome his humble beginnings and achieve success in his chosen field. Mr. Price received A.S.M.'s Medal for the Advancement of Research on behalf of Westinghouse in recognition of its achievements in metallurgy a few years ago.

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To ARTHUR W. THORNTON, assistant to vice-president, operations, National Tube Division, U. S. Steel Corp., on his nomination by the Metallurgical Society of A.I.M.E. as vice-president for one year, and to CYRIL S. SMITH, University of Chicago, JAMES B. AUSTIN, vice-president, fundamental research, U. S. Steel Corp., and J. S. SMART, JR., assistant to vice-president and director of research, American Smelting & Refining Co., on their nominations to the Board of Trustees, Metallurgical Society A.I.M.E. for one year, two years and three years, respectively. Dr. Austin is a past-president A.S.M. Also to JOHN CHIPMAN, Massachusetts Institute of Technology, on being nominated vice-president of the Metallurgical Society A.I.M.E. for 1958.

Invite Comments

A group to study the corrosion of welds in Types 316 and 316-L stainless steels has been organized by the High Alloys Committee of the Welding Research Council. Those metallurgists and welding engineers having experience (good or bad) with these high-molybdenum 18-12 Cr-Ni steels are invited to communicate with the chairman of the group, M. E. Carruthers, Armco Steel Corp., 3400 E. Chase St., Baltimore 13, Md.

Gives Benefits of Cold Forming at Notre Dame

Speaker: R. W. Perry
Parker Rust Proof Co.

Ross W. Perry, manager, Parker Rust Proof Co., presented a talk at a meeting of the **Notre Dame Chapter** entitled "It Is Cheaper to Move Than Remove Metal".

Mr. Perry stated that the automotive companies are very much interested in the cold forming of metals. This method of fabrication is, in a manner of speaking, in competition with the screw machine industry. In cold forming there is no loss of metal or scrap as there is in making parts with a screw machine. Another item in favor of cold forming is that hot rolled material can be used rather than buying material that has had extra finishing operations on it which adds to the cost of the raw product. Cold forming lends itself to automation, thus removing hand operations.

For a company to derive the utmost in benefits from this process, Mr. Perry listed the following items as necessary to its successful utilization:

1. The designer must design or redesign so that the parts can be made by cold forming.
2. There must be adequate and competent tool designers and equipment in the shop.
3. Lubrication of the parts being formed is all important. Lubrication can mean the difference between success or failure in this operation.
4. Production, engineering and management must operate as a team, each carrying their full share of the load.—**Reported by R. C. Pocock for Notre Dame.**

—A Mightier World Through Metallurgy—

OBITUARY

EDWARD J. BOTHWELL, in charge of the distributor sales section, nickel sales department, International Nickel Co., Inc., died late in July after a brief illness. Mr. Bothwell joined International Nickel in 1915 at the research laboratory in Bayonne, N. J., subsequently becoming research assistant. In 1923 he was transferred to the development and research division in New York and in 1928 he joined the company's nickel sales department.

Mr. Bothwell was a member of the New York Chapter.

The San Diego Chapter A.S.M. has reported a 50% membership gain for the 1956-57 year, from 131 members in January 1956 to 199 members in May 1957.

Outlines New Developments in Metals

"New Developments in Metals" Were Outlined by John Convey, Director of the Bureau of Mines & Technical Surveys, Ottawa, at a Meeting of the Ontario Chapter. Present at the speaker's table were, from left: B. Walker, Canadian Carborundum Ltd.; E. Jennings, Ingot Metal Co. Ltd.; Dr. Convey; and T. G. Bradbury, Steel Co. of Canada Ltd., Chapter chairman

Speaker: John Convey
Bureau of Mines & Technical Surveys

About 100 members and guests of the **Ontario Chapter** heard John Convey, director of the Bureau of Mines & Technical Surveys, speak on "New Developments in Metals".

Before discussing these developments, Dr. Convey pointed out that even today our knowledge of metals is still rather sketchy and it is fundamental research which is bringing us slowly toward the time when we will be able to produce "tailor-made" alloys for specific purposes, knowing exactly their behavior and attaining mechanical properties of such magnitude that drastic reductions in the materials will be feasible.

Dr. Convey pointed out that up until approximately five years ago, only 11% of Canada had been geologically surveyed but, due to the stepped-up efforts of the past few years, about 25% has now been surveyed. Also, some metals or such metal concentrations, previously considered commercially of low value, have been attaining greater importance because of improved processing and properties which were not known a few years ago.

Titanium, for instance, was largely considered merely an alloying element up to 1948 and of no great importance for the future. Similarly, there are many other elements today which will play a much greater role in the future when the practical metallurgist, on the basis of the findings of the research man, will devise improved methods of extraction and processing, thus supplying new impetus to the prospector and miner, as well as the tools without which these metals could not be made available to industry.

It is obvious that all progress becomes more and more the result of teamwork of highly trained personnel in many fields of science and while the future appears more promising, with research going on in all fields, it is the privilege of the metallurgist to play a major role in the team responsible for the high standard and its continuous improvements of our civilization.—**Reported by V. G. Behal for Ontario.**

—Advancement Speed by Metallurgy—

Northeastern to Offer Graduate Evening Courses

A complete sequel of graduate metallurgy courses will be offered by Northeastern University. Eight credit courses in Metallography, Advanced Physical Metallurgy and Physics of Metals will be offered to qualified engineers in a program designed to fulfill the need for competent metallurgical research personnel sought by the increasing number of manufacturers of electronics and guided missiles in the Boston area.

The courses were organized by Pascal Levesque, head of metallurgical research, Raytheon Manufacturing Co., with the assistance of Northeastern University professors Alfred Ferreti, chairman of mechanical engineering department, and Emil Gramstorff, dean of the graduate division of the College of Engineering. Larry Kaufman of M.I.T.'s Lincoln Laboratory and John Zotos of Watertown Arsenal will assist in the teaching.

National Officers Visit Birmingham

National Officers Donald S. Clark, President, and W. H. Eisenman, Secretary, Were Guests of the Birmingham Chapter at Its Final Meeting Last Season. Dr. Clark (left) presented a talk on "Yield Phenomena in Metals"

MEN OF METAL

NORMAN C. PESKIN has been appointed to represent the Electronics and Instrumentation Division, Baldwin-Lima-Hamilton Corp., as sales engineer of SR-4 devices and systems for the New England territory.

WILFRED H. STEWART, with a background of 17 years in furnace design, has been appointed staff engineer in the Industrial Furnace Division, Chicago, by Sunbeam Corp.

JAMES S. SHUTE, who has been assistant to the manager, Selas Corp. of America, Combustion Equipment Division, has been appointed head of the newly created Export Division.

V. C. HAWKSLEY has been assigned as branch manager of the Philadelphia warehouse of the Atkins Saw Division, Borg-Warner Corp. He was formerly with the Disston Division of H. K. Porter Co.

CHARLES FREUNDLICH, application engineer on testing machines for Baldwin-Lima-Hamilton Corp., has been appointed sales engineer for testing machines in the New England area.

LEON H. FISH, formerly director of military relations for a West Coast aircraft company, has been named assistant to the president of Acme Precision Products, Inc., a position created as a part of Acme's expansion plans to support the military services.

Gives Talk on Management Development

Leaders at the Sustaining Members Night Meeting Held by Worcester Last Season Included, From Left: Francis E. Kennedy, Technical Chairman; Louis R. Mobley, International Business Machines Corp., Who Gave a Talk on "Management Development"; and W. J. Nartowt, Vice-Chairman, Presiding

W. JOHN PORTER, Jr., will direct sales of mechanical, hydraulic and compacting presses made by the Hamilton Division, Baldwin-Lima-Hamilton Corp., in the New York office.

WILLIAM B. DOWNES has been appointed manager of the stainless steel sales division by Crucible Steel Co. of America, in the Pittsburgh office.

R. A. DADISMAN, director of market development, Armco Steel Corp., has been selected by the Deptrtment of Commerce as a specialist in the fields of distribution and market research to take part in a six-week trade mission to Italy.

G. C. VAN HEUSDEN of Chase Brass & Copper Co. has been promoted to district manager of the New York warehouse and office. He succeeds HERBERT H. BARTLETT who retired Feb. 1, after 31 years of service with Chase.

GLENN P. BAKKEN, executive vice-president since January 1955, has been elected president of Chase Brass & Copper Co.

R. L. GREENE has been made assistant sales manager, special products, and will supervise all activities in connection with aluminum treatments marketed by Parker Rust Proof Co.

PAUL F. GENACHTE, director of the Atomic Energy Division of Chase Manhattan Bank, has been elected to the board of directors of Firth Sterling, Inc.

THOMAS F. GALLAGHER has been appointed district sales manager in the Chicago office of the Laclede-Christy Division of H. K. Porter Co., Inc.

WILLIAM H. KNOELL has been appointed secretary of Crucible Steel Co. of America. He joined Crucible in 1955 as assistant secretary and was formerly assistant to the executive vice-president of Pittsburgh Corning Corp.

Baird-Atomic, Inc., announces the appointments of three sales engineers: WILLARD B. FERGUSON is assigned to 12 southern and western states and Washington, D. C.; EDWARD FORGERON is to look after emission sales and infrared equipment on the West Coast; and NICK GRONDIN will cover territory in eight middle and north central states.

RALPH V. LITTLE, JR., assistant manager, has been named manager of the product engineering department, Brush Electronics Co.

HOWARD E. ADKINS recently resigned from the University of Wisconsin to join the Kaiser Aluminum & Chemical Sales, Chicago, as welding specialist in field engineering.

A.S.M.-W.R.U. Program Ready for Test Runs

The pilot plant mechanized literature searching project being conducted for the American Society for Metals at Western Reserve University has now reached the initial testing stage. More than 5000 abstracts representing much of the important metallurgical literature of 1955 have been processed and will be ready for machine searching in September. An experimental searching selector has been built at the Center for Documentation and Communication Research at Western Reserve University which can be used to make test searches.

members are urged to participate in the test program by submitting typical questions and subjects for literature searches. A limited number of searches will be made covering only the literature of 1955. For those problems selected, pertinent information retrieved will be sent to the inquirer at no charge.

For details, write:

American Society for Metals
Attention: Marjorie R. Hyslop
7301 Euclid Ave.
Cleveland 3, Ohio

Talks on Induction Heating in Rockford

Harry Osborn, Jr., Ohio Crankshaft Co., Spoke on "Induction Heating" at a Meeting Held by Rockford Chapter. Shown during the meeting are, from left: Ural Gillett; Dr. Osborn; and Don A. Campbell, chapter chairman

Speaker: H. Osborn, Jr.
Ohio Crankshaft Co.

Harry Osborn, Jr., technical director, Ohio Crankshaft Co., lectured on "Induction Heating" at a meeting of the **Rockford Chapter.** The Chapter was host during this meeting to 150 men who had completed the educational course given at Rockford College.

Induction heating dates back to the early 1900's when Dr. Northrup developed an induction heating coil for melting metals. In 1925, induction heating began to receive metallurgical interest.

Dr. Osborn explained the basic principles of induction heating, noting that the heating coil and the workpiece form a transformer, the coil being the primary and the workpiece the secondary element.

Typical uses of induction heating include selective hardening, hardening complete pieces, tempering, annealing, heating for forging, brazing and induction melting.

Dr. Osborn described the power sources for induction heating and the advantages and disadvantages of each. Most in use today are the motor-generator sets, vacuum tube oscillators and spark gap oscillators.

The speaker then discussed some of the fundamental formulas used and also the following factors to be considered in induction heating—material, diameter of workpiece, depth of heating and final cost. Some of the many advantages gained by using induction heating include: fast heating rates; little if any scaling or decarbing; fast method of processing; uniformity from piece to piece; less distortion; improved metallurgical properties; usually lower cost per piece; and it can be placed right in the production line.

The main disadvantages of induction heating are the initial installation and tooling cost.

Dr. Osborn showed some 80 slides to illustrate his talk, including slides of the uses of induction heating, the various tooling setups, the different shapes of parts, and some of the metallurgical properties obtained by induction heating.—**Reported by J. F. Sisti for Rockford.**

TECHNICAL PROGRAMS

39th National Metal Congress
and
2nd World Metallurgical Congress

The complete technical programs of the American Society for Metals, the 2nd World Metallurgical Congress and all participating societies will appear in the October issues of METAL PROGRESS and METAL SHOWMAN, both of which will be sent to the total membership of the American Society for Metals, and Conferees in the W.M.C., well before the Congresses convene in Chicago in November.

Reprints Available

Reprints of the article "Tailor Made Metals for Tomorrow", which appeared in a recent issue of *Popular Mechanics Magazine,* have been printed for the American Society for Metals and are being used as mailing pieces to help to emphasize the importance of the metallurgical industry and metallurgists in today's economy and way of life. Extra copies of the reprint may be obtained through A.S.M., 7301 Euclid Ave., Cleveland 3, Ohio.

Lecture Series Covers Heat Treatment and Elements of Metallurgy

Well over 300 persons registered for the educational program on "Heat Treatment and Elements of Metallurgy" sponsored by the **Detroit Chapter.** The lectures were divided into two parts: "Theory", which was given by C. A. Siebert of the University of Michigan; and "Practical Heat Treat Problems", which was given by Norman Kates of Lindberg Heat Treating Co.

Dr. Siebert dealt with the mechanisms by which steel is hardened and the practical implications of the fundamentals. He described the various crystallographic forms of iron, the allotropic transformation in iron and iron carbon alloys, and the iron-carbon equilibrium diagram. The importance of the change in crystal structure, the relative solubility of carbon in the two kinds of crystal structures with respect to hardening of steel, and the volume changes accompanying the transformation from one to the other crystal form were discussed. He described the method of determining the T-T-T diagrams and the role these diagrams play in understanding what occurs during continuous cooling and the formation of the various structures observed in steel. Martensite was defined as an atomic dispersion of carbon in the tetragonal iron lattice. A description was also given of the two methods for studying the martensite reaction—the metallographic and the quenching dilatometer.

Martensite begins to form immediately upon reaching the M_s temperature on cooling and increases in amount until the M_f temperature is reached.

Discussing heat treat distortion, Dr. Siebert noted two main forces to be at work—the volume expansion taking place in the change from face-center cubic lattice to body-center cubic, and straight thermal contraction. These two in combination with changes in section size are the reasons for distortion and cracks occurring during heat treatment.

It was pointed out that the core expands first in case-hardened parts stretching the austenite in the case, which upon further cooling results in the residual compressive stresses found in case-hardened parts.

Dr. Siebert discussed the early development work on hardenability, reviewing such items as cooling curves, the various methods of defining cooling rate, the work done by Russell in England on heat transfer, and the correlation of cooling rate and microstructure for a given steel. This led to the work done on quenching of round bars and the development of the ideal-critical diameter method of analysis. All of this work ultimately resulted in the development of the Jominy hardenability test and the correlation of Jominy tests with the hardness obtainable in round bars.

The hardness of heat treated steel is primarily due to the carbon content. Alloying increases hardenability and also retards tempering rates. The carbide forming elements also promote secondary hardening in tempering.

Mr. Kates pointed out in his lecture that heat treating has to be based on fundamental principles. There is a definite relationship between science and practice. The practical heat treater must have a store of knowledge based on experience, but he must also understand the theoretical basis for his work. A thorough knowledge of theory will also point to short cuts. To properly accomplish the purpose of heat treating, the heat treater must have the cooperation of the steelmaker, the user and the designer.

Steel may now be purchased with many controlled properties which offer safety factors in heat treatment.

The shape and size affect cooling rates and volume changes. Proper design can thus reduce distortion and cracking. The designer should avoid sudden section changes, sharp corners and blind holes, and should try to balance the section size. Removal of decarburization and other surface defects should help. Proper equipment to measure and control temperatures are important. More and more heat treatment is now done in controlled atmospheres and salt baths. The quenching media should be clean, properly circulated and have ample volume. Poor quenching causes a lot of headaches in the shop. Temperatures, holding times, atmospheres and geometry have to be carefully considered to achieve success in heat treatment.

Heat treatment may produce internal stresses in the part, and these can be eliminated by tempering. A "snap draw" at 400° F. should be used if not enough draw facilities are available. Tempering of mixed heats is poor practice.

Mr. Kates cited several examples to demonstrate the facts he stressed during his lecture. He showed a series of 60 slides to demonstrate the type of problems a commercial heat-treat shop experiences, and he indicated the successful solutions to these problems.—**Reported by N. M. Lazar for Detroit.**

—The Crucibles of Today Hold the World of Tomorrow—

IMPORTANT MEETINGS

for October

Sept. 29-Oct. 3—National Screw Machine Products Association: Annual Fall Meeting, Broadmoor Hotel, Colorado Springs, Colo. (N.S.M.P.A., 2860 E. 130th St., Cleveland 20)

Oct. 3-4—Refractories Institute: Fall Meeting, Grand Hotel, Point Clear, Ala. (Avery C. Newton, Executive Secretary, 1801 First National Bank Bldg., Pittsburgh 22)

Oct. 6-10—Electrochemical Society Inc.: Fall Meeting, Hotel Statler, Buffalo, N. Y. (Henry B. Linford, Secretary, 216 W. 102nd St., New York, N. Y.)

Oct. 7-9—National Electronics Conference Inc.: Annual Meeting and Show, Sherman Hotel, Chicago. (J. S. Powers, Executive Secretary, 84 E. Randolph St., Chicago 1)

Oct. 9-11—Committee on Vacuum Techniques: Annual Symposium, Hotel Somerset, Boston. (D. S. Gustin, Secretary, Box 1282, Boston 9)

Oct. 9-11—Gray Iron Founders Society Inc.: Annual Meeting, Drake Hotel, Chicago. (Donald H. Workman, Executive Vice-President, National City-E. 6th Bldg., Cleveland 14)

Oct. 9-11—Society for Experimental Stress Analysis: Annual Meeting, Hotel El Cortez, San Diego. (W. M. Murray, Secretary-Treasurer, P. O. Box 168, Cambridge 39, Mass.)

Oct. 13-17—Pressed Metal Institute: Annual Meeting, Castle Harbor, Bermuda. (H. A. Daschner, Managing Director, 3673 Lee Rd., Cleveland 20)

Oct. 14-17—Wire Association: Annual Convention and Exhibit, LaSalle Hotel, Chicago. (Richard E. Brown, Executive Secretary, 453 Main St., Stamford, Conn.)

Oct. 17-18—Magnesium Association: Annual Convention, Biltmore Hotel, New York. (Jerry Singleton, Executive Secretary, 122 E. 42nd St., New York 17)

Oct. 22-24—National Association of Corrosion Engineers: Annual Western Regional Conference, U. S. Grant Hotel, San Diego. (A. B. Campbell, Executive Secretary, 1601 M & M Bldg., Houston 2, Tex.)

Oct. 27-Nov. 1 — Atomic Industrial Forum and American Nuclear Society: Annual Meetings and 1957 Trade Fair of the Atomic Industry, Plaza Hotel and New York Coliseum, New York. (Charles Robbins, Executive Manager, Atomic Industrial Forum, 3 E. 54th St., New York 22)

Oct. 28-31 — American Nuclear Society: 2nd Winter Meeting, Henry Hudson Hotel, New York. (John Burt, J. M. Mathes, Inc., 260 Madison Ave., New York 16)

Oct. 31-Nov. 2 — National Metal Trades Association: Annual Convention, Conrad Hilton Hotel, Chicago. (Charles L. Blatchford, Secretary, 337 W. Madison St., Chicago 6)

Oct. 31-Nov. 3—National Tool & Die Manufacturers Association: Annual Meeting, Edgewater Beach Hotel, Chicago. (George S. Eaton, Executive Secretary, 907 Public Square Bldg., Cleveland 13)

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METAL SHOWS OWNED AND OPERATED BY THE AMERICAN SOCIETY FOR METALS

A.S.M. Review of Current Metal Literature

An Annotated Survey of Engineering, Scientific and Industrial Journals and Books Here and Abroad Received During the Past Month

Prepared at the Center for Documentation and Communication Research, Western Reserve University, Cleveland, With the Cooperation of the John Crerar Library, Chicago.

Annotations carrying the designation (CMA) following the reference are published also in *Crerar Metals Abstracts*.

A General Metallurgy

322-A. Properties and Control of Electric-Arc Steel Furnace Fumes. Richard S. Brief, Andrew H. Rose and David G. Stephan. *Air Pollution Control Association, Journal,* v. 6, Feb. 1957, p. 220-224.

An industry-wide survey providing much new data. (A8a, D5)

323-A. New Ilmenite Deposits Found. *Chemical and Engineering News,* v. 35, July 1, 1957, p. 21. (CMA)

An ilmenite deposit has been found in New Jersey, extending from Lakewood to Camden and ten miles wide at the broadest point. More deposits are sought. A chemical firm has contracted with Rutgers University to assay the content of the deposits. Soaring land values in the area complicate the economic situation. (A4n; Ti, RM-n)

324-A. Manganese From Low-Grade Ore. *Chemical and Engineering News,* v. 35, July 22, 1957, p. 70.

Canadian process recovers manganese from iron ore tailings; gives high-grade iron as by-product. Manganese sulphate monohydrate is selectively leached from pyrolusite-type ores; elemental manganese is produced electrolytically.
(A11d, C19n, C23p; Mn, RM-n)

325-A. New Horizons for Lithium. P. E. Landolt. *Journal of Metals,* v. 9, June 1957, p. 766-768.

Growth in the consumption of lithium products and metal; ore reserves in U.S. and Canada; methods of concentration and treating ore. 11 ref.
(A4p, A11a, B general; Li, RM-n)

326-A. Waste Disposal Problems in the Metals Finishing Industries. George E. Barnes and Leon W. Weinberger. *Southern Municipal and Industrial Waste Conference, Proceedings, 5th Conference,* Apr. 1956, p. 201-215.

Disposal or recorvery of pickling liquors, cleaning chemicals, metal dust, heavy metals, cyanides, dyes and oils. 4 ref. (A8b, L general)

327-A. Metal Plating Wastes in Municipal Sewerage Systems. F. W. Kittrell. *Southern Municipal and Industrial Waste Conference, Proceedings, 5th Conference,* Apr. 1956, p. 216-227.

Handling of metals, oils, detergents and chemicals. 27 ref.
(A8b, L17)

328-A. Safe Operation of Atmosphere Furnaces. Jack Huebler. *Steel Processing,* v. 43, June 1957, p. 337-340, 342-343.

Recommendations of safeguards which represent accumlated experiences with a wide variety of operations. (A7p, J2k)

329-A. Copper Mines and Prospects Adjacent to Landlocked Bay, Prince William Sound, Alaska. Miro Mihelich and R. R. Wells. *U. S. Bureau of Mines, Report of Investigations 5320,* Apr. 1957, 21 p.

Where accessible for sampling, the copper content of the deposits ranged from a few hundredths of a percent to over 8%; zinc, gold and silver are present in negligible amounts. Flotation tests of a sample composited to represent typical mine-run ore indicate that 81% of the copper is recoverable in a product assaying 28% copper at a concentration ratio of 17.5:1. (A4n; Cu)

330-A. (English.) **Ilmenite-Magnetite Ore Field in Finland.** V. Paeaekkoenen. *Finland Geologinen Tutkimuslaitos, Bulletin 171,* 1956, 87 p. (CMA)

The Otanmaeki field of ilmenite and magnetite is described geologically and details of the ore deposits are given, including microscopic features of the ore rock, ore types, metal content of different areas, and structure of the ore rocks. Similarities and differences are noted with the Norwegian fields of Roedsand, Titania and Glaafjeld.
(A4n; Ti, RM-n)

331-A, (French.) **Renewed Interest in the Metal Mines in Albigeois and the Maure Mountain Region.** V. Charrin. *Génie Civil,* v. 134, May 1, 1957, p. 206-208.

New tungsten deposits found in the Albigeois region, which also has iron ores, pyrites, manganese, copper, silver, lead, zinc. Maure Mountain area has zinc, lead, silver, copper, all apparently worth commercial exploitation.
(A4n, W, Fe, Mn, Cu, Ag, Pb, Zn, RM-n)

The subject coding at the end of the annotations refers to the revised edition of the ASM-SLA Metallurgical Literature Classification. The revision is currently being completed by the A.S.M. Committee on Literature Classification, and will be published in full in late spring or early summer. A schedule of the principal headings in the revised version was published in the February issue.

332-A. (French.) **Molybdenum; Its Extraction, Its Metallurgy.** R. E. Warriner. *Metallurgie et la Construction Mecanique,* v. 89, June 1957, p. 539-546. (CMA)

A review of molybdenum technology covers recovery from its various ores, reduction to the metal, production of chemical compounds (particularly the pure oxide), world consumption, and properties and applications of molybdenum alloys and compounds. (A general; Mo)

333-A. (German.) **Scientific Background of the Production of Metallic Tungsten for the Electrical Lamp Industry and Factors Influencing Its Quality.** T. Millner. *Acta Technica,* v. 17, 1957, p. 67-111.

Summary of research and technology underlying Hungarian tungsten production for the lamp industry. Chemical, physical and mechanical properties of tungsten wire. 61 ref. (A general, T1a, 17-7; W)

334-A. (German.) **Waste Water in the Electroplating Industry.** Robert Weiner. *Metallwaren-Industrie und Galvanotechnik,* v. 48, Feb. 1957, p. 50-72.

Types of waste water; permissible concentration of contaminants, methods of decontamination, practical application of decontamination, analyses of waste waters. 14 ref.
(A8b, L17)

335-A. (German.) **Clarification of Toxic Waste in Electroplating Concerns.** Joseph Wittmann. *Metallwaren-Industrie und Galvanotechnik,* v. 48, Feb. 1957, p. 81-86.

Plans, calculations and actual experience in building a waste water treatment system. (A8b, L17)

336-A. (German.) **Rhenium and Its Extraction in the Mansfield Smelting "Wilhelm Pieck" Works.** Georg Lindemann. *Neue Hütte,* v. 2, Feb-Mar. 1957, p. 200-203.

Discovery of rhenium and its occurrence in Mansfield copper slate; early extraction from blast furnace salamanders; present-day extraction from lead-zinc flue dust; its chemical and physical properties, applications. 4 ref.
(A8a, A8d, A11a; Re, 17-7)

337-A. (German.) **Economics of Pig Iron Production in the German Demo-**

cratic Republic. Joachim Tischendorf and Hans-Georg Strauss. *Neue Hütte,* v. 2, May 1957, p. 269-280.

Raw material; blast furnace and low shaft furnace; blooming process; acid melting; ore mixing and preparation. 19 ref.
(A4p, B general, D general; ST, RM-n)

338-A. (Japanese.) **Aluminum and Its Alloys as Construction Material.** Toyoji Shioda. *Metals,* v. 27, June 1957, p. 459-465.

Mechanical properties, applications, heat treatments and corrosion resistance of pure aluminum, aluminum-manganese alloys, aluminum-magnesium-silicon alloys, aluminum-copper alloys, aluminum-copper-magnesium alloys and aluminum-zinc-copper-magnesium alloys.
(A general; Al)

339-A. (Japanese.) **Super-Heavy Alloys.** K. Nishizama. *Metals,* v. 27, June 1957, p. 467-472.

Alloys of tungsten with nickel or copper are described. Machinabilities, thermal and electric conductivities and mechanical properties are described. Applications, especially from the viewpoint of absorption efficiency of emmission spectra, are given. 7 ref.
(A general, W, *Ni, Cu*)

340-A. (Polish.) **National Income Versus Steel Production.** Kazimierz Andrysik. *Hutnik,* v. 24, Jan. 1957, p. 18-22.

Statistical data of national income and steel production of U. S. A., U. S. S. R. and Poland. 12 ref.
(A4; ST)

341-A. Titanium Mineral Developments in Australia. *Chemical Engineering and Mining Review,* v. 49, Sept-Oct. 1956, p. 59-62. (CMA)

Production and export statistics for 1948-56 are given for rutile and ilmenite mineral production from the East and West coasts of Australia. The consumption of rutile in the U. S. is not expected to exceed 75,000 tons, 57,000 tons of which would supply the metal producing industry. U. S. imports may come partly from Mexico. United Kingdom's demand for rutile is about 3500 tons annually for metal production. During 1957 the bulk of ilmenite exported will go to Japan.
(A4n; Ti, RM-n)

342-A. Distribution of Nickel in the Lambertville Diabase. Thomas W. Storm and Heinrich D. Holland. *Geochimica et Cosmochimica Acta,* v. 11, no. 4, 1957, p. 335-347.

The concentration of nickel in plagioclase, pyroxene and magnetite in the diabase sill exposed south of Lambertville, N. J., has been determined colorimetrically. It was found that almost all of the nickel is contained in the pyroxene and magnetite, and that the concentration of nickel in these fractions decreases markedly toward the top of the sill. 6 ref. (A11a; Ni_2, RM-n)

343-A. Titanium. Maurice Cook. *Industry and Mining Standard,* v. 112, June 20, 1957, p. 11-12, 14. (CMA)

History, extraction processes, useful properties and applications of titanium. The American chemical industry has used titanium in many places, and in Britain titanium components are being evaluated in plants handling fertilizers, ammonia, sulphuric acid and oil derivatives.
(A general; Ti, 17-7)

344-A. Some Aspects of Progress in the Nickel Industry. L. B. Pfeil. *Journal of the Institute of Metals,* v. 85, July 1957, p. 457-461.

Recent advances in prospecting for nickel ores, ore concentration and smelting and refining of nickel; present-day applications.
(A general, B14, C21; Ni, 17-7)

345-A. New Techniques Aid Metallurgical Research at the N. P. L. E. I. Brimelow. *Metallurgia,* v. 56, July 1957, p. 9-12.

Work of the Metallurgy Division of the National Physical Laboratory includes brittleness in iron, X-ray diffraction and radioactive tracer techniques, creep and fatigue, magnesium alloys, and effect of fire on tensioned wires of prestressed concrete. 3 ref. (A9h)

346-A. Geology of the Questa Molybdenum (Moly) Mine Area, Taos County, New Mexico. J. H. Schilling. *New Mexico Institute of Mining and Technology, Bulletin 51,* 1956, 72 p. (CMA)

The veins are largely quartz and molybdenite, with locally abundant biotite, fluorite, pyrite, chalcopyrite, calcite and rhodochrosite, and were deposited as cavity fillings in late Tertiary time. Large low-grade deposits of molybdenite may occur around the margins of the granite stocks. (A11a; Mo, RM-n)

347-A. Scoreboard for 15 Rare Metals, Their Status, Prospects. *Steel,* v. 141, July 1, 1957, p. 44-45.

U. S. consumption, production, reserves, stockpiles and research.
(A4p, A9; EG-b)

348-A. Tool Steel Selection. *Tool Engineer,* v. 39, July 1957, p. 121-124.

Guide to selection of proper grades of toolsteel for approximately 400 applications. (A general; TS, 17-7)

349-A. Investigations of Rhenium. C. T. Sims. Battelle Memorial Institute (Wright Air Development Center). *U. S. Office of Technical Services,* PB 121653, Sept. 1956, 86 p. $2.25.

Basic physical, mechanical and electronic properties, with emphasis on the future electronic and electrical uses of the highly promising metal. A new method was developed for preparation of high-purity rhenium powder by reduction of a hydrolyzed rhenium halide. Electrical resistivity and specific heat were investigated from room temperature to about 2300° C. Electromotive forces generated by some rhenium-alloy thermocouples also were studied.
(A general, T1, 17-7; Re)

350-A. (French.) **Growth of the Aluminum Industry in the United States.** G. A. Baudart. *Revue de l'Aluminium,* no. 244, June 1957, p. 601-604.

The U. S. is now the world's largest producer of aluminum, 1,523,000 tons in 1956 in a world total of 3,400,000 tons—a 45% share. Reviews the history of the aluminum industry and describes future plans of expansion through 1959.
(A4p, A2; Al)

351-A. (Italian.) **Etruscan Mines and Metalworking Plants.** Giuseppe Caneva. *Fonderia Italiana,* v. 6, Apr. 1957, p. 162-165 and p. 175.

Locations of deposits assumed from surviving evidence to have been worked in the Etruscan period; mining and manufacturing methods. 4 ref. (A2, B12)

352-A. (Japanese.) **Titaniferous Iron Sand Deposits at Shikabe-Mura, Southern Hokkaido.** T. Banba and T. Igarashi. *Geological Survey of Japan, Bulletin,* v. 7, 1956, p. 35-40. (CMA)

Alternating sand layers near Shikabe village contain titaniferous magnetite. The main deposits are located along rivers and are underlain with agglomeratic gravel. Total ore tonnage is estimated at five million tons, averaging 15% iron and 2% titania. (A4n; Ti, Fe, RM-n)

353-A. (Rumanian.) **Titaniferous Iron and Zirconium Alluvial Deposits, New Raw Material Source for the Titanium Industry.** O. Maieru and C. Superceanu. *Revista de Chimie,* v. 7, Mar. 1956, p. 145-147. (CMA)

A new source of raw materials for titanium production, located in the region of Fagaras, in the Carpathian Mountains, contains mainly ilmenite, zircon and garnets. Concentrations of 17-27% Ti and 0.3-0.4% Zr were obtained. 3 ref.
(A11a; Ti, Zr, RM-n)

354-A. (Rumanian.) **Raw Material Bases.** C. Superceanu and O. Maieru. *Revista de Chimie,* v. 8, Apr. 1957, p. 221-227. (CMA)

A new source of raw material for the chemical-metallurgical industry of titanium and zirconium products comprises the alluvial deposits at Fagaras in the Carpathian Mountains. Average concentrations of about 1-3 kg. per cu. m. of ilmenite, rutile and zircon were found, from which final concentrations of 40% TiO_2 and 20% ZrO_2 were obtained. 4 ref.
(A11a; Ti, Zr, RM-n)

355-A. (Rumanian.) **Investigation of the Production Possibilities of a Titanium Concentrate From Domestic Alluvial Sands.** L. Cobrescu and Inna Giurcanu. *Revista de Chimie,* v. 8, Apr. 1957, p. 227-230. (CMA)

Considerable variations in the quantities of useful and sterile minerals were found in the alluvial sand of the domestic alluvium containing ilmenite, magnetite, garnet and rutile. First concentrations of 0.7-2% TiO_2 were obtained at 0.5 mm., permitting final concentrations to about 40%. 5 ref.
(A11a, B14; Ti, RM-n)

356-A. (Book.) **American Bureau of Metal Statistics, Yearbook.** 133 p. 1956. American Bureau of Metal Statistics, 50 Broadway, New York 4, N. Y. $3.

World production statistics of nonferrous metals (copper, lead, aluminum, gold and silver) listed by country. Details of consumption, exports, imports, prices, ore reserves and refining of these metals.
(A4; EG-a)

357-A. (Book.) **Yearbook of the American Iron and Steel Institute, 1956.** 268 p. American Iron and Steel Institute, 150 E. 42nd St., New York 17, N. Y.

Proceedings of the 64th general meeting of the Iron and Steel Institute of May 23-24, 1956. Three papers abstracted separately.
(A general, D general; ST)

358-A. (Book.) **American Society for Metals, Transactions,** v. 49, 1957. American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio. $10.

Papers, lectures and reports presented at the 38th Annual Convention, Oct. 6-17, 1956. The Campbell Memorial Lecture by C. S. Barrett is abstracted separately; other papers were abstracted as preprints in 1956. (A general)

359-A. (Book.) **Metallurgy of the Rarer Metals. Pt. 5. Molybdenum.** L. Northcott. 222 p. 1956. Butterworths Scientific Publications, 33 Kingsworth WC2, London. (CMA)

History, occurrence and uses of molybdenum; extraction; physical

properties; powder metallurgy; arc melting; fabrication; mechanical properties of molybdenum and its alloys; oxidation and protection of molybdenum. (A general; Mo)

360-A. (Book.) **Northern Rhodesia Chamber of Mines Year Book.** 1956. 126 p. Northern Rhodesia Chamber of Mines, Kitwe, Northern Rhodesia.

Information and statistics concerning the Northern Rhodesia copper mining industry.
(A4n, B12; Cu, RM-n)

361-A. (Book.) **Handbook of Hard Metals.** W. Dawihl. 162 p. 1957. Philosophical Library, Inc., 15 E. 40th St., New York 16, N. Y. $10.

An abridged translation of "Handbuch der Hartmetalle". First part deals with scientific principles of sintering; second part with technical production of hard metals.
(A general, H general; SGB-q)

B Ore and Raw Material Preparation

71-B. Refractories. D. M. Humby. *Castings,* v. 3, Mar. 1957, p. 22-33.

Note on historical development and types of manufactured refractories giving characteristics and application in metal industry. Discusses alumina, silica, basic, special purpose, insulating, plastic and castable refractories. (B19; RM-h)

72-B. Preparation of Scrap for Open Hearth Furnaces. Vernon W. Jones. *Iron and Steel Engineer,* v. 34, May 1957, p. 104-108.

Proper scrap preparation important for decreasing openhearth furnace charging time; shearing, bundling, bailing and transporting operation in a scrap yard.
(B23, D2, W12, 1-2; ST, RM-p)

73-B. Flotation of Uranium and Pyrite at Vogelstruisbult Gold Mining Areas Ltd. F. O. Read, E. H. D. Carman and C. L. M. Gough. *South African Institute of Mining and Metallurgy, Journal,* v. 57, Feb. 1957, p. 419-458.

A flotation process, treating slime reclaimed from the old slime-dam and current Main-reef slime after cyanidation for gold extraction, produces a concentrate weighing 6%, with a recovery of 40% U_3O_8 and 90% sulphur. (B14h; Au, U)

74-B. Final Treatment and Evaluation of Uranium Concentrates. M. G. Atmore. *South African Institute of Mining and Metallurgy, Journal,* v. 57, no. 8, Mar. 1957, p. 535-543.

Precipitated ammonium diuranate is stored in a slurry. Outlines collection and weighing, slurry sampling, slurry filtration, extruding and drying, sampling and packing, calcined sample preparation and analysis. (B14; U)

75-B. Laboratory Control of the Uranium, Acid and Flotation Plants at the Virginia O. F. S. Gold Mining Co. Ltd. L. B. Richards. *South African Institute of Mining and Metallurgy, Journal,* v. 27, no. 8, Mar. 1957, p. 544-564.

Laboratory design, equipment, personnel, safety, planning the analytical control program, sampling and preparation, routing samples in the laboratory, process control of plants, methods of analysis, research and development. (B14a, A9; U)

76-B. History of Tin Mining. Pt. 2. Tin Mining in Early Times. *Tin,* May 1957, p. 110-112.

Early mining methods employed by the Phoenicians, Romans, Normans and English in the Cornish tin mines 1200 to 1700 A.D.; mining history in other parts of the world. (To be continued.) (B12, A2; Sn)

77-B. (French.) **2nd Symposium on the Agglomeration of Iron Ores.** *Metallurgie et al Construction Mecanique,* v. 89, June 1957, p. 527-537.

Summary of the papers submitted at the Symposium organized by the Institut de Recherches de la Sidérurgie (I.R.S.I.D.): mechanism of agglomeration on grates, heat transfer, elimination of sulphur and other impurities, physical properties of agglomerates, influence of various additions. Agglomeration processes; reports on tests made in France and England. (To be continued.)
(B14m; Fe, RM-n)

78-B. (German.) **Ore Dressing of Metals of Special Importance to Nuclear Engineering.** Helmut Kirchberg. *Neue Hütte,* v. 2, Feb-Mar. 1957, p. 77-84.

Dressing of minerals containing uranium, thorium, lithium, zirconium, titanium and beryllium deposits, and bismuth and cobalt ores. 27 ref. (B14; U, Th, Li, Zr, Ti, Be, Bi, Co, RM-n)

79-B. (German.) **Investigations in Lead Volatility in Roasting Zinc Ores.** Heinz Jahn and Helmut Winterhager. *Zeitschrift für Erzbergbau und Metallhüttenwesen,* v. 10, May, 1957, p. 226-234.

Sinter experiments with a number of variables; influence of additives; annealing in preparation for the use of the multiple-story furnace; various lead compounds in the processes; a combination of processes resulting in lead removal of over 70%. 17 ref. (B15; Zn, *Pb*)

80-B. (Japanese.) **Study on Titanium Compounds in Red Mud.** N. Sugiyama. *Light Metals (Tokyo),* v. 7, May 1957, p. 26-31. (CMA)

Various titanium oxides from the red mud of the Bayer alumina process were studied to determine the form they take. When TiO_2 is treated with caustic soda, the precipitate corresponds to $Na_2O.6TiO_2.7H2O$; less Na_2O is combined if Fe_2O_3 is present. The titanium in high-titanium bauxite of India exists mainly as uncombined TiO_2, but treatment at low pressure with less concentrated alkaline solution causes the formation of a compound containing Na_2O. The more vigorous the treatment the more Na_2O is combined, up to $6Na_2O.TiO_2.7H_2O$.
(B14; Al, *Ti*)

81-B. (Japanese.) **Sodium Compounds in Bayer Alumina Process.** Shigetoshi Mori, Eiichi Ishikawa and Shigeru Seimiya. *Light Metals,* v. 7, May 1957, p. 32-36.

Determination of the structure of sodium-aluminum silicate present in red mud during the Bayer alumina process. The compound, precipitated by means of the reaction between sodium aluminate and sodium silicate, was examined by chemical analysis and X-ray diffraction. Analysis of findings. 7 ref.
(B14; Al)

82-B. (Polish.) **Arsenic Removal From Iron Ores by Sintering Process.** Eugeniusz Mazanek and Ryszard Benesch. *Hutnik,* v. 24, Feb. 1957, p. 45-47.

Survey of arsenic removal methods; description of experiments with arsenic removal by sintering; addition of sodium chloride was found to be beneficial.
(B16a; Fe, RM-n, *As*)

83-B. (Swedish.) **Method for Direct Reduction of Iron Ore Concentrate by Carbon Monoxide Without Melting.** Otto Stelling and Ivan Pereswetoff-Morath. *Jernkontorets Annaler,* v. 141, no. 5, 1957, p. 237-260.

When iron oxides in a fluidized bed are reduced by carbon monoxide at high temperatures, the process is retarded by the fact that the grains adhere to each other when a certain content of metallic iron is attained. However, if the reduction is accomplished under suitable conditions in a fluidized bed at a lower temperature (about 600° C.), cementite is formed instead of metallic iron, and no tendency to adhesion can be observed. Under the conditions used the formation of cementite is so rapid that the carbon monoxide does not decompose into carbon and carbon dioxide. Reaction velocities have been determined for different hematite ores as well as oxidized and nonoxidized magnetites. A technical process has been worked out based on the experimental results obtained and has been studied on a pilot plant scale. 6 ref. (B15q; Fe, RM-n)

84-B. Material Handling in the Sinter Process. Martin Vander Laan. *Blast Furnace and Steel Plant,* v. 45, July 1957, p. 727-730.

Flow chart from receipt of raw material to delivery into the blast furnace. (B16a, A5b; Fe, RM-n)

85-B. Importance of the Spinel Phase in the Steel Industry. Pt. 3. E. F. Osborn. *Industrial Heating,* v. 24, June 1957, p. 1215-1220.

Section on spinel phases in fireclay refractories shows phase equilibria relations for alumina, iron oxide, silica system at different oxygen pressures; spinel phases and transformations in iron ore covering maghemite and magnetite; advantages of ferromagnetic spinel structure in beneficiation process. 10 ref. (B14, B19; ST, RM-h)

86-B. (German.) **Use of "Komplexon" in Ore Analysis.** Heinz Grundlach. *Zeitschrift für Erzbergbau und Metallhüttenwesen,* v. 10, Apr. 1957, p. 177-182.

Methods for determining chief constituents in carboniferous and sulphide ores with particular reference to the use of the disodium salt of ethylene - diamine - tetra - acetic acid, known in the trade as Komplexon, Titriplex or Idranal. 7 ref.
B11, S11; RM-n)

C Extraction and Refining

203-C. Magnesium Extraction Process for Plutonium Separation From Uranium. Irvin O. Winsch and Leslie Burris. *Chemical Engineering Progress,* v. 53, May 1957, p. 237-242.

High-temperature extraction process for the separation of plutonium from nuclear reactor core and blanket materials is described and data are presented. Molten magnesium, which is immiscible with molten uranium, may be used to extract plutonium from uranium. The plutonium may be separated from the

magnesium by volatilization of the magnesium. Auxiliary operations such as molten-metal transfer, phase separation and sampling are also discussed. 6 ref.
(C26; Pu, U, *Mg*, 17-7)

204-C. Bureau of Mines Process for Reactor-Grade Zirconium and Hafnium. *Chemical Week,* v. 80, July 29, 1957, p. 73. (CMA)

The Bureau of Mines has developed a process at Albany, Ore., for producing reactor-grade zirconium and hafnium by reducing the metal chlorides with a magnesium-sodium mixture. The hafnium purification by iodine dissociation is obviated. Magnesium and liquid sodium are charged into the reactor. The temperature is brought to 725-759° C., and is further raised to 850° C. when the sodium is consumed. Magnesium completes the reduction. The eutectic salt produced melts at 650° C. and drains out of the reactor during distillation. The reason for fewer impurities is unknown. In scale-up operations now under way, 184-lb. batches of hafnium will be produced. (C1p; Zr, Hf)

205-C. Preparation of Electrolytic Bath of Molten K_2TiF_6. T. Hatano, M. Kawane and S. Okada. *Electrochemical Society of Japan, Journal,* v. 25, Feb. 1957, p. 63-69. (CMA)

The optimum condition in the preparation of the salts for an electrolytic bath of molten K_2TiF_6 and the properties of the electrolyte were studied. The chloride method was used in preference to the carbonate method for refining lithium chloride. $TiCl_4$ is the best starting point for the double fluoride. The only suitable crucible material is artificial graphite. Melting temperatures were less accurate with greater concentrations of double fluoride. The anhydrous K_2TiF_6 crystal has the lattice parameters a = 5.71Å and c = 4.65Å. (C23p; Ti)

206-C. Atmospheric Versus Pressure Leaching of Uranium Ores. R. G. Beverly, A. W. Griffith and W. A. Millsap. *Journal of Metals,* v. 9, June 1957, p. 746-751.

Pilot plant studies on alkaline leach process by which uranium is extracted from ore by hot carbonate solutions. Factors affecting leach include contact time, temperature, oxidation, pressure, sodium carbonate and bicarbonate concentrations, size of grind and pulp density. Leaching time reduced with high temperature and pressures. 10 ref.
(C19n, 2-24; U, RM-n)

207-C. Ammonium Carbonate Pressure Leaching of Uranium Ores. B. G. Langston, R. D. Macdonald and F. M. Stephens, Jr. *Journal of Metals,* v. 9, June 1957, p. 752-756.

Process for dissolution of uranium in ore by ammonium carbonate solutions and precipitation of uranium from pregnant solutions. Nine ores studied to evaluate effect of temperature, pressure, carbonate concentration, amount of oxidation required, comparison with sodium carbonate and acid leach methods as to economy. 3 ref. (C19n; U, RM-n)

208-C. Uranium Recovery by the Solvent Extraction Process. James D. Moore. *Journal of Metals,* v. 9, June 1957, p. 757-761.

Solvent extraction process for recovering uranium from the leach solution where sulphuric acid leaching method has been used. Dodecyl phosphoric acid solvent used in pilot plant at Vitro Uranium Co. Hydrochloric acid used to recover uranium from solvent. (C19n; U)

209-C. Manganese From Low-Grade Ores by the Ammonium Carbonate Process. J. Y. Welsh and D. W. Peterson. *Journal of Metals,* v. 9, June 1957, p. 762-765.

Process depends on the fact that manganous oxide forms soluble complex in aqueous solutions containing high concentrations of ammonia and carbon dioxide. This complex is an intermediate in formation of manganese carbonate. Gives equipment and operating conditions for process which has found successful commercial application.
(C19; Mn, RM-n)

210-C. Some Notes on Oroya Copper Slags. I. L. Barker, J. S. Jacobi and B. H. Wadia. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, June 1957, p. 774-780.

Investigation of the interrelationship between copper and magnetite content of reverberatory slags; withholding converter slag when melting reverberatory slag resulted in cleaner waste slag; possibility of treating converter slag by separate process. 4 ref. (C21c; Cu, RM-q)

211-C. Reduction of Nickel by Hydrogen From Ammoniacal Nickel Sulfate Solutions. V. N. Mackiw, W. C. Lin and W. Kunda. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, June 1957, p. 786-793.

Detailed examination of the reaction by which nickel can be precipitated from aqueous ammoniacal nickel sulphate solutions by hydrogen at elevated pressures and temperatures. Discusses thermal dynamics; studies effect of ammonia temperature, ferrous iron concentration and its catalytic effect and considers autocatalytic nature of nickel reduction. 12 ref. (C26; Ni, *H*)

212-C. Dissolution of Lead Sulfide Ores in Acid Chlorine Solutions. M. I. Sherman and J. D. H. Strickland. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, June 1957, p. 795-800.

Study of reaction of chlorine in aqueous solutions with galena to form both sulphate and elemental sulphur; sulphur formed by hydrolysis of sulphur chloride which adheres to the ore; kinetic data and calculations of chemical rate constants and energy of activation. 8 ref. (C19r, P13a, P13b; Pb)

213-C. Use of the Ion-Exchange Process in the Extration of Uranium From the Rand Ores With Particular Reference to Practice at the Randfontein Uranium Plant. D. E. R. Ayers and R. J. Westwood. *South African Institute of Mining and Metallurgy, Journal,* v. 57, Feb. 1957, p. 459-521.

Uranium sulphate obtained by leaching low-grade uranium ores with sulphuric acid can be adsorbed on ion exchange resins as an anionic uranium sulphate complex. Most of the impurities in the solutions are not adsorbed, resulting in an eluate in which the uranium has been concentrated approximately 20-fold. The plant and method of its operation are described in detail with graphs of the concentrations of the various ions involved throughout the cycle. Performance figures are given. 42 ref. (C19s; U)

214-C. Recovery of Tributyl Phosphate Solvent Employed in the Extraction Separation of Hafnium and Zirconium. W. R. Millard and R. P. Cox. *U. S. Atomic Energy Commission,* ISC-234. 30 p. (CMA)

Development of the tributyl phosphate extraction of hafnium from zirconium. About five stages are necessary for complete water-stripping of the zirconium in the mixer-settler extractor. The degeneration of the solvent on extended use may be eliminated by two methods; the batch method with sulphuric acid and sodium carbonate washes, and a continuous method with sulphuric acid and water washes. The latter is faster because of the shorter settling times. Further work is necessary to evaluate the continuous regeneration process. (C19; Hf, Zr)

215-C. Chlorination of Purified Oxide. L. P. Twichell. *U. S. Atomic Energy Commission,* Y-574. Mar. 10, 1950. 16. p. (CMA)

Various methods of chlorinating zirconium-dioxide were studied. None of the liquid phase reactions were successful, nor was chlorination at high temperature. Conversion was satisfactory with the reactant CCl_4 at 500° C. Equipment described. The faster reaction rate at higher temperatures is offset by contamination from the equipment. The cost per pound of contained zirconium for this chlorination is $0.61. (C19r; Zr)

216-C. Description of Permanent Zirconium Plant. Carbide and Carbon Chemicals Co. *U. S. Atomic Energy Commission,* Y-B46-114. Sept. 1951, 14 p. (CMA)

The Y-12 plant for producing hafnium-free zirconium is described. The process involves hafnium extraction, phthalate purification, conversion to the hydroxide, chlorination and magnesium reduction.
(C19r, C26; Zr)

217-C. Attempts to Manufacture Uranium-Zirconium Alloys by Co-Reduction of Their Tetrafluorides. L. G. Weber. *U. S. Atomic Energy Commission,* NYO-1346. Sept. 23, 1952, 6 p. (CMA)

The bomb reduction of uranium and zirconium tetrafluorides together with magnesium to form the alloys was studied. The bomb liner was magnesium fluoride. There were no operational difficulties, but stratification was shown in the zirconium content range 0.2-0.4% and heterogeneity in the 5% zirconium region. (C1p; U, Zr)

218-C. Separation of Zirconium-Hafnium Using Solutions Containing Tributylamine. R. G. Shaver, et al. *U. S. Atomic Energy Commission,* KT-148. Oct. 18, 1952, 34 p. (CMA)

Method for separation of hafnium from zirconium, based on solvent extraction with thiocyanate from the tetrachloride in a spray-column system, is noted. The improvement of the process was studied by adding amines to dissolve the solid thiocyanate which forms in the column. Tributylamine offers the best compromise between aqueous insolubility and effectiveness in reducing thiocyanic acid decomposition. Formation of solids renders the system inoperable at about 50% amine concentration. Emulsification and flooding in the pulse column occur only when amine is present. The organic phase becomes dark and viscous and

is not regenerated by the scrubbing system. Hafnium production is improved more than zirconium production by the addition of amines. (C1p; Zr; Hf)

219-C. Literature Survey on the Co-Reduction Process for Producing Zirconium-Uranium Alloys. W. B. Clymer and O. R. Magoteaux. *U. S. Atomic Energy Commission,* FMPC-193. Apr. 30, 1953, 5 p. (CMA)

A survey of five references to zirconium-uranium alloys and their production was used to gather data on the co-reduction method of producing the alloys. The development work of Iowa State College and Mallinckrodt Chemical Works is cited. The alloys produced are divided into two classes, depending on whether the zirconium content is more or less than 10%. For those with less, fused dolomite liners are used; for those with more, graphite liners are used. K_2ZrF_6 gives a better product than ZrF_4 when calcium or magnesium is the reductant. Iowa State College used iodine as a booster. (C26; Zr, U)

220-C. Process for Separating Thorium Compounds From Monazite Sands. K. G. Shaw, M. Smutz and G. L. Bridger. *U. S. Atomic Energy Commission,* ISC-407. Jan. 1954, 107 p. (CMA)

The sulphuric acid digestion of monazite sand was studied for the purpose of deriving a thorium-containing matter suitable to purification by liquid-liquid extraction. The process developed includes the fractional precipitation of the lanthanons by neutralization with ammonium to pH 2.3 subsequent to the thorium separation and prior to the precipitation of uranium phosphate and the remaining lanthanons. The concentrates containing lanthanons were suitable to the separation of individual lanthanons. The process is about $2.37 cheaper per lb. of thorium produced than the Battelle process. 52 ref. (C19n; Th)

221-C. Solid and Liquid Drossing of Thorium Containing Tracer Level Fission Products. N. D. Potter. Atomics International. *U. S. Atomic Energy Commission,* NAA-SR-1734, Apr. 15, 1957, 16 p.

Thorium, containing tracer amounts of fission products, was drossed at about 1700 and 1100° C. In the latter case 10% manganese alloy was used. Materials used in the drossing process included solid oxides, carbides, nitrides, sulphides, and a liquid mixture of oxide-fluoride. The best decontamination of fission products was achieved by drossing with sulphide and the oxide-fluoride mixture, which removed some zirconium. (C6; Th)

222-C. (French.) **Methods for Checking the Purification of Aluminum by Zone Melting.** F. Montariol. *Bulletin de l'Institut International Du Froid* (International Institute of Refrigeration), Supplement, Annexe 1956-2, Sept. 1956, p. 63-69.

Experimental conditions employed. Two heating processes were used: the resistance oven and induction heating. Results of both methods are given together with anomalies observed in certain purification diagrams. 4 ref. (C28k, 1-2; Al)

223-C. (French.) **Separation of Certain Rare Earth Elements by Dry Means. Application to Ytterbium.** Jean-Claude Achard. *Comptes Rendus,* v. 244, June 17, 1957, p. 3059-3062. (CMA)

The divalent elements samarium, europium and ytterbium can be separated by distillation from a mixture of rare earth oxides and carbon at high temperature in vacuo. It is shown that ytterbium can be eliminated in its entirety from a mixture of rare earths and recovered either in the form of the pure metal or a lower oxide. 5 ref. (C22g, 1-23; EG-g, Yb)

224-C. (German.) **Zinc Research in the German Democratic Republic.** Kurt Peukert. *Neue Hütte,* v. 2, Feb-Mar. 1957, p. 186-191.

Discussion on zinc-containing raw materials; lead concentrates of the Freiberg ore reservoir; zinc-lead flue dust from the Mansfield smelting works; zinc, cadmium, indium extraction from Freiberg floated blende through roasting and electrolysis; use of the oxygen-roasting technique for Mansfield smelting works flue dust; introduction of reverberatory-lime soda melting; increase of zinc sulphate, zinc oxide and lead products; improvements in selenium, germanium, gallium, iodine and rhenium extraction. (C general, B14, B15, A8a; Zn, Se, Ge, Ga, Rh, RM-n)

225-C. (Japanese.) **Thermal Production of Metallic Magnesium From Sea Water Magnesia.** Shoichro Nagai, Jotaro Ono and Hiroshi Yoneyama. *Light Metals,* v. 7, May 1957, p. 60-64.

Raw materials used in this experiment are magnesia obtained from sea water and calcium silicide reducing agent. The magnesia and calcium silicide are ground and mixed, and briquetted. When the briquet is vacuum-reduced for several hours at high temperature, magnesium is evaporated from the briquets and condensed on a removable sleeve of the retort. Reaction time, reaction temperature, mol ratio and particle size are discussed. (C22h, B16d; Mg)

226-C. (Japanese.) **Thorium for Nuclear Reactors.** *Metals,* v. 27, June 1957, p. 475-479.

Methods of production of metallic thorium in Japan; reduction of thorium from thorium oxide; sintering and sintering furnaces. (C general, B16a; Th)

227-C. Manufacture of Titanium. James Taylor. *Advancement of Science,* v. 13, June 1957, p. 359-363. (CMA)

Titanium tetrachloride production, effected by chlorinating a suitable rutile ore-coke mixture. Magnesium and sodium reductions of titanium tetrachloride. Titanium melting operations now use uncooled consumable titanium electrodes. Titanium fabrication methods differ from the conventional mainly in the need for lubrication to prevent galling and seizing, and the need to guard against contamination. (C general, F general, G general; Ti)

228-C. New Commercial Process for Electrowinning Manganese. M. C. Carosella and R. M. Fowler. *Journal of the Electrochemical Society,* v. 104, June 1957, p. 352-356.

With new process it is possible to smelt a manganese ore to ferromanganese and a slag, then recover the manganese in the slag as electrolytic manganese. 21 ref. (C23p; Mn)

229-C. Preparation of Thorium Bismuth Dispersions From Electrolytic Thorium. M. E. Sibert, M. A. Steinberg and R. J. Teitel. *Journal of the Electrochemical Society,* v. 104, June 1957, p. 374-378.

Materials are potentially useful as fuels for liquid metal reactors. Dispersions were prepared by addition of crushed thorium cathode deposits to bismuth, addition of as-deposited cathode to bismuth in the cell, and by electrolysis of ThCl, using a liquid bismuth cathode. 11 ref. (C23p; Th, Bi)

230-C. Arc Melting of Reactive Metals. J. L. Ham and C. B. Sibley. *Journal of Metals,* v. 9, July 1957, p. 976-980. (CMA)

The cold mold arc melting of reactive metal ingots is practical and versatile. The trend is toward the use of consumable electrodes and vacuum. The discussion covers power partition, melting efficiency, pressure, bath volume, superheat and minimum vacuum pumping speed. The energy required to melt titanium, zirconium, molybdenum and vanadium and other metals is theoretically proportional to their melting points, but in practice depends on electrode resistance, pressure and mold size. (C5h; Ti, Zr, Mo, V)

231-C. Quick Trip From Ingot to Strip. F. L. Church. *Modern Metals,* v. 13, June 1957, p. 36-40.

New Hazlett machine produces aluminum slab ½ to 3 in. thick, up to 36 in. wide at speeds of up to 25 ft. per min. Tolerances are tight, surface smooth, grain size small, scrap negligible, costs low. (C5q, 1-2; Al)

232-C. Something From "Nothing". Vacuum Melting, Heat Treating Produce Better Metals. Roger Giler. *Plant Engineering,* v. 11, June 1957, p. 128-131.

Reasons for using vacuum in metal treating; review of vacuum equipment; vacuum induction melting furnaces—types and applications. (C5, H general, 1-23, 1-2)

233-C. Purification of Nuclear Fuels by Melting in Refractory Oxide Crucibles. H. M. Feder, N. R. Chellew and M. Ader. Argonne National Laboratory. *U. S. Atomic Energy Commission,* ANL-5255, Mar. 15, 1954, 49 p.

Investigation of the phenomena occurring during the melting of irradiated uranium in refractory oxide crucibles. Under favorable circumstances certain fission product elements are separated to a considerable extent. Some of the separations achieved have been correlated by theoretical considerations. Application of this process to reactor technology is considered. Its use in connection with the enriched core of a fast neutron pile appears to be particularly attractive. (C28, T11g, 17-7; U)

234-C. Studies of the Bomb Reduction of Thorium Halides. H. A. Saller, J. R. Keeler and L. J. Cuddy. Battelle Memorial Institute. *U. S. Atomic Energy Commission,* BMI 988, Mar. 22, 1955, 19 p.

The bomb reduction of ThF_4 was studied primarily to determine the feasibility of substituting magnesium for all or part of the calcium reductant. Limited investigations of the ThF_4 reduction were also made to determine the effects produced by variation of the amount of $ZnCl_2$ and calcium in the charge, substitution of ZnF_2 for the $ZnCl_2$ booster, and addition of salts to the charge to reduce the viscosity of the slag. (C1p; Th)

235-C. Recovery of Uranium From Fused Salt Melts by Electrodeposition. L. W. Niedrach and G. R. Fountain. Knolls Atomic Power Laboratory, *U. S. Atomic Energy Commission,* KAPL-1693, Mar. 29, 1957, 18 p.

Recovering uranium values from waste salts of an electrorefining process for reactor fuels; behavior of uranium and representative active metal fission product elements. 10 ref. (C23p; U)

236-C. Zone Melting of Uranium. C. I. Whitman, V. Compton and R. B. Holden. Sylvania Electric Products, Inc. *U. S. Atomic Energy Commission,* SEP-179, June 15, 1955, 20 p.

Possible application of the zone melting technique to the separation of uranium from fission products and other impurities. Although zone melting did not appear promising as a method of processing irradiated uranium because of slagging of fission products into the surface of the bar, this technique has potential application to removing such fission products as zirconium, columbium and ruthenium, and to purifying ordinary uranium from such impurities as boron, iron, silicon, nickel and cobalt. (C28k, 217; U, 9-1)

237-C. Research on Intermetallic Containers for Melting Titanium. W. B. Crandall, C. H. McMurty and D. D. Button. Wright Air Development Center, Technical Report 56-663. *U. S. Office of Technical Services,* PB 121948. Feb. 1957, 39 p. (CMA)

The utility of Mo_3Al as a container for titanium was determined experimentally. Titanium wets the container during melting but takes in only 3% total molybdenum and aluminum if the time and temperature used are minimized. (C5, 1-2, 17-7; Ti, Mo, Al)

238-C. (German.) **Pressure Leaching of Sulphide Ore.** E. Discher and F. Pawlek. *Zeitschrift für Erzbergbau und Metallhüttenwesen,* v. 10, Apr. 1957, p. 158-166.

Investigation into the effect of pressure, temperature, grain size, reaction time and concentration in aqueous solution on pure natural sulphide of copper, nickel, zinc, iron and lead, and on Rammelsburg ore, Australian lead-zinc ore, Peruvian copper-zinc ore and a South African nickel-copper concentrate. 4 ref. (C10n; Cu, Ni, Zn, Fe, Pb, RM-n)

239-C. (Japanese.) **Theoretical Analysis and Practical Measurement of Electromagnetic Forces in Vertical Spike-Type Aluminum Smelting Furnaces.** Shizuo Asano and Ichiro Tomohiro. *Light Metals,* v. 7, May 1957, p. 43-50.

Electromagnetic forces in large aluminum smelting furnaces are of such strength that normal operation may be disturbed. The vertical spike-type furnace is characterized by perpendicular anodes and bus bars. Electromagnetic forces of the spike-type furnaces are evaluated and their effect on the metal level are investigated. (C23p, 1-2; Al)

240-C. (Rumanian.) **Production of Titanium Dioxide.** Galia Gruder, Inna Giurcanu and C. Raducanu. *Revista de Chimie,* v. 8, Apr. 1957, p. 231-233. (CMA)

A laboratory procedure for the production of titanium dioxide from the concentrates of alluvial sands consists of the treatment of the concentrates with sulphuric acid, dissolving of the sulphates, reduction of the iron, separation of the iron sulphate by crystallization and hydrolysis. Yields of 80.5% TiO_2, with a purity of 98% were obtained. 13 ref. (C10; Ti)

241-C. (Russian.) **Study of the Iodide Method of Refining Zirconium. Pt. 1 and 2.** V. S. Emel'yanov, P. D. Bystrov and A. I. Evstyukhin. *Atomnaya Energiya,* no. 1, 1956, p. 43-51; no. 3, 1956, p. 122-131. (CMA)

The mechanism of iodide refining of zirconium was investigated using small flasks in which crude zirconium and iodine were placed separately and refined zirconium, formed from zirconium tetra-iodide, was deposited around a heated tungsten wire. It was found that the pressure of the tetra-iodide played an essential part in determining the rate of the deposition. 17 ref. (C1p; Zr)

D Iron and Steelmaking

182-D. Oxygen Lancing of Pig Iron and Subsequent Fume Treatment With a Pease-Anthony Venturi Scrubber. P. K. Gledhill, P. J. Carnall and K. H. Sargent. *Iron and Steel Institute, Journal,* v. 186, June 1957, p. 198-211.

Report on trials arranged by Dorman Long (Steel) Ltd., Redcar Works: experimental layout and equipment; process description; analytical procedure; conclusions. Scrubber used cleaned submicron iron oxide fume to concentrations of approximately 0.1 grains per cu. ft., giving a colorless stack-gas after evaporation of water vapor. It is probable that outlet dust concentration can be still further reduced by increasing pressure drop across the Venturi from 15 to 30 in. w.g. 16 ref. (D1h, A8a; CI-a)

183-D. (German.) **Automation in the Metallurgical Industry.** Reinhold Perlick. *Neue Hütte,* v. 2, Feb-Mar. 1957, p. 92-102.

Problems of blast furnace regulation; present status and recent developments in the steel industry; technological and economic conditions necessary for automating rolling mills, difficulties encountered. Specific subjects covered are pig iron, openhearth steel, electric steel and rolling mills. (D general, F23, 18-24)

184-D. (German.) **Openhearth Furnaces With Special Reference to the Maerz Type.** Reinhold Baake and Harry Stollberg. *Neue Hütte,* v. 2, Feb-Mar. 1957, p. 157-167.

Gas production from central German soft coal briquets; influence of the gasification method; gas connection to furnace; influence of dust; high preheating temperatures and influence of infiltrated air on preheating; furnace pressure; flow in the chambers; standards for gas pressure; stack draft; resistance inside the furnace and gas and air speeds; width and length of air shaft; kinetic energy of gas flow in the upper furnace; infiltrated air in the intake head; peculiarities and advantages of the Maerz head. 37 ref. (D2h, B17)

185-D. (German.) **Prevention of Steel Flocculation.** Wolfgang Küntscher and Karlheinz Werner. *Neue Hütte,* v. 2, May 1957, p. 280-285.

Melting method; charging materials; degassing of molten steel; degassing in the solid state. 9 ref. (D9s; ST)

186-D. (German.) **Cooling of Industrial Furnaces With Special Reference to Openhearth Furnaces.** Rudolf Schröter. *Neue Hütte,* v. 2, May 1957, p. 285-289.

Cooling, shortest possible cooling rate for refractory linings, laws of cooling and possibilities for the acceleration of cooling, heat transfer and its regulation, observation and improvement of operations during repairs. 7 ref. (D2h, P11k; ST)

187-D. (German.) **Detonation and Shock-Wave.** Michael Hansen. *Stahl und Eisen,* v. 77, June 13, 1957, p. 805-813.

Combustion, explosion and detonation; sound velocity of gases; shock-wave without heat input; shock-wave with heat input; blasting pressure of tubes; shock-tube; pressure and temperature in the shock-wave and after its reflection; explosions combined with shock-waves; computation examples; conclusions for blast furnaces and other plants. (D11j, D1)

188-D. (Japanese.) **Study on the Behavior of Titanium Compounds in the Blast Furnace. Reproduction of the Titanium "Bear" in the Laboratory and Its Melting.** B. Eto. *Iron and Steel Institute of Japan, Journal,* v. 43, Mar. 1957, p. 211-213. (CMA)

Reproduction of titanium "bear" in the laboratory was achieved by melting the artificial slag of the system SiO_2-CaO-Al_2O_3-MgO with an addition of pure iron powder and low-grade TiO_2 at 1400° C. in a stream of pure nitrogen. The titanium "bear" was attributed to the formation of titanium nitride or titanium cyanide in the slag and the catalytic role of iron was found necessary to the formation of these compounds. Increasing the amount of titanium in the slag gave rise to an increase of silicon in the pig iron, since the pig iron containing increased amounts of titanium favored the reduction of silica in the slag. (D11n, D1g; Fe, *Ti,* RM-q, AD-p)

189-D. (Japanese.) **Studies on the Improvement of Steel Quality by Treating With Titanium Slag. Pt. IV. Characteristics of Steel Ingots Containing Titanium.** T. Shimose, Z. Takao and W. Hirano. *Iron and Steel Institute of Japan, Journal,* v. 43, Mar. 1957, p. 357-359. (CMA)

The effect of adding titanium to 40-kg. steel ingots was studied. The composition of the steel used in the experiment was 0.28% C, 0.60% Mn, 0.30% Si, 0.037% P and 0.040% S. The addition of up to 0.15% Ti to the ingots caused a gradual decrease in sulphur segregation and also in dendritic formation, but the latter showed a tendency to increase with further titanium addition. Titanium combined with oxygen and nitrogen in the molten steel to reduce defects such as ghosts encountered in steel ingot production. Titanium also produced excellent hot working characteristics in the ingots. No appreciable change in the tensile strength of the steel was observed as a result of the titanium addition. (D9r; ST, *Ti,* RM-q, AD-p)

190-D. (Japanese.) **Electrical Conductivity of Molten Slags Containing Ti-**

tanium Oxide. Pt. IV. The CaO-SiO₂-TiO₂ System. K. Mori. *Iron and Steel Institute of Japan, Journal,* v. 43, Mar. 1957, p. 379-380. (CMA)

The behavior of TiO_2 in the molten state of the slag system $CaO-SiO_2-TiO_2$ was investigated by electrical conductivity measurements, using a platinum crucible and electrode. The electrical conductivity of the molten slag increased with increasing amounts of CaO when TiO_2 was kept constant. On the other hand, the same effect was observed with increasing TiO_2 when the $CaO:SiO_2$ ratio remained constant. When the concentration of TiO_2 is low the electrical conductance is of ionic nature, due to Ca^{+2}. However, it is probably of electronic nature at high TiO_2 concentration, and its semiconductive properties become pronounced.
(D11n, P15g; ST, *Ti*, RM-q, AD-p)

191-D. (Japanese.) **Basicity of Slags Containing Titanium Oxide.** K. Mori. *Iron and Steel Institute of Japan, Journal,* v. 43, Mar. 1957, p. 380-381. (CMA)

To investigate the basicity of slags containing TiO_2 the binary systems SiO_2-TiO_2 and $CaO-TiO_2$ of various compositions were mixed with iron oxide, equilibrated at 1480° C. under an atmosphere of CO_2 and CO (ratio $CO_2:CO = 13.3$), and analyzed for values of the ratio $Fe^{+3} + Fe^{+2}$. In the binary SiO_2-TiO_2 system, TiO_2 behaves like a base when the TiO_2 concentration is low, but becomes acidic with increasing TiO_2. The system $CaO-TiO_2$ was found to be definitely acidic.
(D11n; ST, *Ti*, RM-q, AD-p)

192-D. (Japanese.) **Influence of Charging Size on Blast Furnace Operation.** Takashi Kosuge and Koretaka Kodama. *Iron and Steel Institute of Japan, Journal,* v. 43, Apr. 1957, p. 421-431.

Operational particle size specifications are given for magnetite and hematite. The coke ratio was 0.597 during the tests. The relation between ore size, permeability and reducibility of ore was found to be significant. (D1a; Fe, RM-n)

193-D. (Japanese.) **On the V-Segregates of Large Steel Ingots.** Masayoshi Kawai. *Iron and Steel Institute of Japan, Journal,* v. 43, Apr. 1957, p. 431-437.

The V-inclination of V-segregates has close correlations with the height to diameter ratio of ingots; relations between the flaws in V-segregates and various casting conditions are indicated. (D9; ST, 9-19)

194-D. (Polish.) **Example of Slag Ionic Theory Application to Quantitative Interpretation of Metal-Slag Reaction.** Andrzej Staronka. *Hutnik,* v. 24, Feb. 1957, p. 51-55.

Definition of slag alkalinity according to molecular and ionic theory; sulphur distribution equilibrium between the metal and the basic slag; example of equilibrium constant computation on the basis of ionic theory. 15 ref. (D11n; RM-q)

195-D. (Polish.) **Steel Desulphurization Problem in Basic Openhearth Furnace.** Tadeusz Mazanek. *Hutnik,* v. 24, Feb. 1957, p. 55-58.

Modern concepts of steel desulphurization in basic furnaces; desulphurization technology in basic openhearth furnaces; desulphurization problem in Polish steel mills and possibilities of improvement. (D11n, D2d; ST, *S*)

196-D. Injection of Lime Through the Blast-Furnace Tuyeres. Paul B. Stubbs. *Blast Furnace and Steel Plant,* v. 45 June 1957, p. 599-600, 613.

Two-month test with full-scale injection equipment was made. Results indicated that this is not a promising method for controlling sulphur or improving smoothness of furnace operation. However, injection of other finely divided solids may warrant future testing.
(D1a, 1-2; NM-f44, ST)

197-D. Use of Low-Carbon Iron From Hot-Blast Cupolas in Open-Hearth Furnaces. *Foundry Trade Journal,* v. 102, June 13, 1957, p. 736.

West German steelworks use hot-blast cupola metal to reduce charging and refining time for openhearth furnace operation. (D2g; ST)

198-D. New Process Makes Rolled Steel Directly From Pig Iron. *Iron Age,* v. 179, June 27, 1957, p. 97-100.

Swedish powder process makes steel from pig iron by granulating pre-refined pig iron, boxing granules, heating, decarburizing and rolling into steel sheet; mechanical properties of processed steel. (D8q; ST)

199-D. Gaseous Ore-Reduction Processes. Experiments on Egyptian Iron Ores. *Iron and Coal Trades Review,* v. 174, May 17, 1957, p. 1127-1131.

Investigates the possibilities of hydrogen reduction of Egyptian iron ores. Describes some laboratory trials using hydrogen and petroleum gas. (D8j; Fe, RM-n)

200-D. Combustion and Heat Transfer in an O. H. Furnace. S. W. Pearson, M. W. Thring and J. H. Chesters. *Iron and Steel,* v. 30, June 1957, p. 324-326.

Summary of 80-page report of a large-scale trial to check mathematical theory of heat transfer in openhearth furnace. (D2h, P11k)

201-D. Blast Furnace U. S. A. Pt. II. The Age of Mineral Coal. M. O. Holowaty and C. M. Squarcy. *Journal of Metals,* v. 9, July 1957, Sec. 1, p. 957-963.

Covers 1750 to 1850; rise of Pittsburgh and the Pennsylvania iron industry; mineral coal replaced charcoal as furnaces grew larger and the blast was heated. (D1; RM-j42)

202-D. Swedish Oxygen Steelmaking. Folke Johannson. *Journal of Metals,* v. 9, July 1957, Sec. 1, p. 972-975.

Kal-Do process was developed to convert high-phosphorus iron into steel of openhearth quality using high-purity oxygen. Process is also economical for low-phosphorus iron. (D10; ST)

203-D. Blast Furnace Oxygen Operations. Julius H. Strassburger. *Proceedings of the 64th General Meeting of the Iron and Steel Institute,* 1956, p. 175-207.

Operation of oxygen plant with 450 tons daily capacity at Weirton Steel Co. Oxygen used for enrichment of blast, for blast furnace iron production and other steel plant operations. Operation of air cleaners, compressors, heat exchangers, high-pressure columns, acetylene and carbon dioxide eliminators, expanders, and oxygen compressors in the oxygen plant; oxygen control and effect of oxygen enrichment on blast furnace operations. (D1h, 1-2)

204-D. Study of Desulphurization of Cupola Iron With Magnesium (in Ladle). V. I. Lakomskii. *Liteinoe Proizvodstvo,* no. 1, Jan. 1957, p. 9-11. (*Henry Brutcher Translation* no. 3946).

Kinetic study of the desulphurization of ingot iron-ferrous sulphide mixtures by technically pure magnesium. Variation of degree of desulphurization with amount of magnesium added and with temperature. Heat of desulphurization and energy of activation of desulphurization. (D9m, P12q, Fe, *S, Mg*)

205-D. Continuous Casting of Steel, Studied With Radioisotopes. B. N. Katomin and V. S. Rutes. *Izvestiya Akademii Nauk OTN,* no. 1, Jan. 1957, p. 123-135. (*Henry Brutcher Translation* no. 3944).

Study of solidification of billets (slabs) in continuous casting by use of radioactive P^{32}, S^{35}, and liquid lead, and measurements of temperature inside the billet, in an effort to establish correlations among depth of liquid phase, distribution of solidification boundary, rate of billet solidification, quantity of heat removed, speed of descent, cooling rate, and physical properties of billet. Formation of a solid shell on billet in mold; heat exchange in mold; comparison with still-cast ingots; effect of penetration of water from secondary cooling into gap between billet and mold upon mean solidification coefficient. (D9q; ST, 14-13)

206-D. Gases and Nonmetallic Inclusions in Continuous Cast Steel. V. I. Yavoiskii. *Proceedings of the First All-Union Conference on the Continuous Casting of Steel—Oct. 1955,* 1956, p. 199-211. (*Henry Brutcher Translation* no. 3964).

Segregation, distribution and amounts of nonmetallic inclusions and gases (hydrogen and nitrogen) in continuous cast steel compared with still-cast ingots. Macrosegregation characteristic of continuous cast rectangular and square sections; nature of light band running along the edges. Nonmetallic inclusions—overall quantity and uniformity of distribution in continuous cast as against still-cast steel.
(D9q; ST, EG-m, 9-19)

207-D. (German.) **Use of Oxygen in Refining Pig Iron.** Walter Bading. *Stahl und Eisen,* v. 77, July 11, 1957, p. 926-931.

Reasons for the use of oxygen in the production of steel; use of oxygen mixed with the air in the bottom-blowing converter; safety of operation in the application of pure oxygen to the process of blowing oxygen onto the surface of the steel bath; precautionary measures in installing the pipes; incorporation of safety devices to prevent accidents.
(D10, D1h, D2g, D3f; ST)

208-D. (German.) **Dephosphorization of Basic Converter Steel.** Hans Kosmider and Hermann Schenck. *Stahl und Eisen,* v. 77, July 11, 1957, p. 917-926.

Effect of a high lime addition in obtaining a very low phosphorus content; shortening of the time of afterblow and reduction of iron losses by use of small amounts of secondary slag; value of the slag produced as a fertilizer; manganese, sulphur and nitrogen reaction during dephosphorization.
(D3d, D11n; ST, RM-q)

209-D. (Polish.) **Humidification of the Blast in Blast Furnaces.** Zbigniew Rychlik and Wladyslaw Sabela. *Hutnik,* v. 24, Apr. 1957, p. 147-153.

Reasons for blast humidity control; conditions and results of humid blast application; measurement of blast humidity; manual control; automatic control. 7 ref. (D1h, X7)

210-D. (Polish.) **Possibilities of Open-hearth Production Improvement by Analysis of Technical and Economical Indexes.** Pawel Kielski. *Hutnik,* v. 24, Apr. 1957, p. 153-158.

Method of recalculation of technical and economical indexes in terms of tons of steel produced; application of the results in obtaining objective estimates and correct conclusions. (D2, A4p; ST)

211-D. (Russian.) **Reason for Fast Smelting of X21H11B2,5 Steel.** V. V. Panin. *Liteinoe Proizvodstvo,* no. 1, Jan. 1957, p. 11-14.

Moscow and Ural electric smelting techniques for heat resisting steel; arguments in favor of the fast technique. (D5; SS, SGA-h)

212-D. (Book.) **Bibliography on the Continuous Casting of Steel, 1933-1957.** 21 p. 1957. Iron and Steel Institute, 4 Grosvenor Gardens, London, S.W.1. 25s, nonmembers; 15s, members.

Chronological references with abstracts; indexes to authors; processes and plants in operation. (D9q; 11-15)

E Foundry

307-E. Die Casting at the Hoover Co. Kenneth L. Mountain. *Foundry,* v. 85, June 1957, p. 98-105.

Continuing research, quality control, design preplanning and production experience result in high-quality die castings. Compositions of zinc and aluminum alloys and the methods used in die casting, trimming, finishing, gating, venting at the Hoover Co. (E13; Zn, Al)

308-E. The Carbon Dioxide Process. Walter E. Gruver. *Foundry,* v. 85, June 1957, p. 106-110.

Basic reaction of carbon dioxide with sodium silicate in forming silica gel for giving strength to sand cores and molds. Relation of core strength after gassing and after baking to gassing time, sodium silicate content and other materials present. (E18)

309-E. How to Design for Sound Stainless Steel Castings. J. L. Lessman. *Foundry,* v. 85, June 1957, p. 114-117.

Suggestions in casting design for eliminating shrinkage, cracks and defects including notes on feeding, casting section, uniformity and thickness, proper design of cored areas and corners and consideration of typical problems. (E general, 17-1; SS)

310-E. Swedish Foundry Prepares Sand Automatically. C. G. Soderlund. *Foundry,* v. 85, June 1957, p. 118-121.

Automatic mixing, moisture control, ventilating and material conveying systems; moisture content of sand adjusted on basis of dielectric property of sand measured between condenser plates. (E18p, E18r, 18-24)

311-E. Foundry Expansion. Robert H. Herrmann. *Foundry,* v. 85, July 1957, p. 86-90.

Operations following a carefully planned expansion in an iron, brass and aluminum foundry including molding, coring, pouring and cleaning practices. (E11; CI, Cu-n, Al)

312-E. Brass Casting Design From the Foundry Viewpoint. Harry St. John. *Foundry,* v. 85, July 1957, p. 91-93.

Ease of casting and coring should be considered in the design of castings and specification of alloys to be employed. (E11, 17-1; Cu-r)

313-E. A New Method for Studying Riser Requirements of Castings. John Varga, Jr., *Foundry,* v. 85, July 1957, p. 106-109.

Method developed for presenting in graphical form results of research on the shape of risers required for casting simple shapes. By selecting suitable parameters and plotting on log-log co-ordinates, data were found to produce straight lines making it easier to analyze and study feeding requirements. 5 ref. (E22q; CI)

314-E. Quality Control in Pressure Die-Castings. J. E. Carvell. *Metal Industry,* v. 90, Apr. 26, 1957, p. 325-327, 334.

Important procedures include chemical analysis, radiographic inspection, visual control, dimensional control, weight testing and careful checking of cores and ejectors. (E13, S general)

315-E. New Look in Cleaning Rooms. Cecil King. *Modern Castings,* v. 31, June 1957, p. 52-54.

Vibrating shakeout, punches, shears, grinders and shot-blast units; used in cleaning cast cylinder block for automobiles. (E24, 1-2)

316-E. Guide to Engineered Castings. *Modern Castings,* v. 31, June 1957, p. 55-70.

Recommendations for structural designs covering section proportioning and thickness; molding and coring simplification; guide for selecting casting alloys gives information on the range of mechanical and physical properties of gray iron, pearlitic malleable iron, nodular iron, carbon and low-alloy steels, aluminum, copper, magnesium, nickel and zinc-base alloys; summary of molding and casting processes and their characteristics. 65 ref. (E general, 17-1)

317-E. Instrument Maker Solves Production Problems. L. H. Fitch. *Precision Metal Molding,* v. 15, June 1957, p. 36-37.

Bronze and zinc investment castings used to make complex precision instruments economically. (E15, X general, 17-7; Cu-s, Zn)

318-E. (German.) **Contour Precision in Chilled Castings.** Ernst Brunhuber. *Giesserei-Praxis,* v. 75, Apr. 10, 1957, p. 134-136.

A method for obtaining precision cast pieces, examples given to illustrate technical difficulties involved. (E22r)

319-E. (Japanese.) **Casting Stress in Wheel Arms.** Shosaku Kobayashi. *Casting Institute of Japan, Journal,* v. 29, Feb. 1957, p. 87-97.

Cracks, breakage and deformation are sometimes introduced into castings by a small amount of shock after they are completed. Factors responsible for increasing casting stress are cooling rate, high moisture content in molds, variation in volume to surface area of different parts. Annealing the casting is a good way to reduce casting stress; high-temperature casting is also recommended. 7 ref. (E25n, Q25; 9-22, 9-24)

320-E. (Japanese.) **Studies on Fluidity of Cast Steel.** Zenichiro Tako, Ituo Araki, Masayasu Arikawa and Takaaki Shimose. *Iron and Steel Institute of Japan, Journal,* v. 43, Apr. 1957, p. 457-465.

Simple and accurate measuring method of fluidity for the purpose of establishing standard melting practice of electric cast steel and effect of oxygen content in molten steel. 21 ref. (E25p; ST)

321-E. (Japanese.) **Effects of Coke Size in Cupola Operation.** Nobutaro Kayama, Katsutoyo Nozaki and Takio Takamori. *Casting Institute of Japan, Journal,* v. 29, May 1957, p. 333-342.

The cupola used had an internal diameter of 520 mm., effective height of 2310 mm., tuyere ratio of 5, and no forehearth. As coke size got smaller, the amount of carbon dioxide in effluent gas from cupola decreased, tapping temperature dropped and coke bed lowered remarkably. Fluctuation of operating conditions were least when medium-sized coke was used. The same held true for the properties of the castings. 4 ref. (E10a; RM-j43)

322-E. (Japanese.) **Studies on CO_2 Process, Especially on Sodium Silicate Binders.** Jiro Kashima and Hisao Miyasaka. *Casting Institute of Japan, Journal,* v. 29, May 1957, p. 348-353.

Sodium silicate binders for CO_2 process; water-soluble starch, dextrine, cornstarch and silica sol mixed with waterglasses investigated; physical properties of molds bonded with such specially prepared waterglasses studied; reactivity of binders with CO_2; strength, ease of mulling and stripping. About 1% addition of organic binders such as water-soluble starch, dextrine and cornstarch is preferable; about 5% addition of silica sol is recommended. (E18n)

323-E. (Japanese.) **Segregation in Castings. Report 5.** Kazuo Yasuda and Kiichiro Amano. *Casting Institute of Japan, Journal,* v. 29, May 1957, p. 354-361.

Three different systems of aluminum alloys, Al-Cu, Al-Mg and Al-Si, were used in these experiments. In the rapidly cooled castings, inverse segregation appeared at the outer and inner layers, as well as normal segregation in the intermediate layer (i.e., two stages of inverse segregation were indicated). In the slowly cooled castings, however, the inverse segregation at the outer layer did not appear. 6 ref. (E25n; Al, 9-19)

324-E. (Russian.) **Casting Systems for Aluminum and Magnesium Alloys.** M. M. Vasilenko. *Liteinoe Proizvodstvo,* no. 2, Feb. 1957, p. 2-3.

Description of the bottom fed casting technique; advantages of the top fed technique; diagrams of molds of both techniques. (E22; Al, Mg)

325-E. (Russian.) **Fast Preparation of Coated Sand Mold Mixtures.** A. I. Korotkov. *Liteinoe Proizvodstvo,* no. 2, Feb. 1957, p. 4-5.

Description of dry, hot and cold sand-resin blends; deficiencies of the three methods. A method utilizing a prewetted sand is described. The most convenient solvent for sand prewetting is furfural. 3 ref. (E19n)

326-E. (Russian.) **Automation of Shell Mold Production.** I. V. Efimov. *Liteinoe Proizvodstvo,* no. 2, Feb. 1957, p. 6-8.

A semi-automatic apparatus for wax mold production is described.

Drawbacks of semi-automatic production are given. (E19c, 1-2)

327-E. (Russian.) **Economics of Foundry Production in East Germany.** F. Nauman. *Liteinoe Proizvodstvo,* no. 2, Feb. 1957, p. 22-24.

The necessity of lowering the reject percentage (now 30%) is stressed. Chill mold technique is recommended. Designers are urged to use more iron castings in place of steel castings. The use of magnesium-treated cast iron should be increased. New methods such as centrifugal castings, die casting and use of shell molds are of great value. (E general, A4; CI, ST)

328-E. (Swedish.) **How to Get Tight Castings.** M. Itzel and G. Lindström. *Gjuteriet,* v. 47, May 1957, p. 73-76.

Choice of material and casting design in a high-pressure hydraulic system. Malleable iron is preferred to steel. Molding and feeding are determining factors for the design. (E11, T4d, 17-7; CI-s, 17-1)

329-E. (Swedish.) **Rationalization in a Fettling Shop.** Henry Nilsson. *Gjuteriet,* v. 47, May 1957, p. 77-81.

A 33% capacity increase has been obtained by a rationalization with special regard to centrifugal fettling machines, exchangable tumbling mills, transportation and chipping and grinding of rough castings. (E22, E24, 1-2, 18-17)

330-E. **Production of Machine-Tool Castings.** G. W. Nicholls. *British Foundryman,* v. 50, June 1957, p. 296-308.

Production flow diagram and manufacturing methods. Standardization and effective control are applied to all foundry operations and materials including sands, refractories, drying technique, gating and risering techniques, venting, metal operations, pouring and cleaning. 5 ref. (E11)

331-E. **Hot-Blast Cupola as an Economic Unit for Producing Castings to B.S.1452, Grade 12.** J. Henderson. *British Foundryman,* v. 50, June 1957, p. 309-323.

Description of plant, charge composition, metallurgical control, daily analysis results, slag analyses. Comparison with cold blast operating costs. (E10a; CI)

332-E. **Fuel Oil in Foundries.** T. Marsden. *British Foundryman,* v. 50, June 1957, p. 324-334.

Formulas for calculation of heat losses in tanks and pipelines and pressure losses in ring mains. Hints on venting, filtering and ring main and tank design. Limitations, advantages and disadvantages of popular types of burners. (E general, A11e, RM-k30)

333-E. **The Carbon Dioxide Process.** G. E. Parramore. *British Foundryman,* v. 50, July 1957, p. 359-371.

Progress in production of iron and nonferrous castings using CO_2 process. Details of tests investigating thermal properties of CO_2 process sand, dry sand, oil sand and green sand containing 5.5% moisture. 6 ref. (E11, E18r)

334-E. **An Evaluation of the Carbon Dioxide Process.** J. E. O. Little. *British Foundryman,* v. 50, July 1957, p. 372-379.

Costs are compared with oil-sand core making and dry-sand molding. (E19, E21, 17-3)

335-E. **Development of Die Casting in Europe.** R. Lewis Stubbs. *Foundry Trade Journal,* v. 102, June 6, 1957, p. 691-696.

Historical development, current methods and advances in zinc and aluminum alloy die casting in Great Britain and Continental Europe. (E13; Zn, Al)

336-E. **Cold-Setting Cores.** *Foundry Trade Journal,* v. 102, June 13, 1957, p. 717-720.

British and American practices in mixing sand, drying oil and oxygen releasing catalyst in the production of cold setting cores; advantages of cold setting cores. (E21g)

337-E. **Stewarts and Lloyds' Tollcross Steel Foundry.** A. R. Parkes. *Foundry Trade Journal,* v. 102, June 13, 1957, p. 723-730.

Illustrated description of Scottish iron factory giving plant layout, compositions of irons and steels cast; note on sand preparation, molding, drying, coremaking, knock-out, heat treatment, cleaning, handling and testing facilities and practices. (E general)

338-E. **Founding of Magnesium.** E. F. Emley. *Foundry Trade Journal,* v. 103, July 11, 1957, p. 33-38.

Casting alloys, preliminary considerations in melting and refining, preparation of melts and pouring procedure. (To be continued.) 15 ref. (E general; Al)

339-E. **Founding of Magnesium.** E. F. Emley. *Foundry Trade Journal,* v. 103, July 11, 1957, p. 33-38.

Sand casting, gravity and pressure casting of magnesium alloys. Advantages and applications of magnesium castings. 34 ref. (E11, E13; Mg)

340-E. **Vacuum Die Castings: Quality *in,* Porosity *Out.*** F. J. Egan, Jr., *Iron Age,* v. 179, May 9, 1957, p. 107-109.

Zinc and aluminum die castings made with vacuum equipment are free from porosity and production is increased. Vacuum equipment consists of hood enclosing die platen area, vacuum pump and accumulator. (E13, 1-2, 1-23; Zn, Al)

341-E. **Making Components for Oil Filters, Guns and Lubricators.** *Machinery,* v. 90, May 24, 1957, p. 1140-1152.

Machines and operations in die casting zinc alloy grease gun barrels and caps; boring and thread chasing operations on cast caps; milling, boring and other operations. (E13, G17, 1-2; Zn)

342-E. **Shell Castings.** H. G. Sieggreen. *Mechanical Engineering,* v. 79, June 1957, p. 560-562.

Procedure, advantages and examples. (E16c)

343-E. **Making Quality Brass and Bronze Castings. Defects Due to Melting, Pouring and Solidification.** Robert A. Colton. *Modern Castings,* v. 32, July 1957, p. 29-34.

Enumerates types of defects due to contamination, gas and melted metal, improper pouring temperature and turbulence. Procedure recommended for eliminating defects. (E25n, 9; Cu)

344-E. **How We Converted to Water-Cooled Cupolas.** James McConville and Andrew Fishels. *Modern Castings,* v. 32, July 1957, p. 41-44.

Problems encountered and benefits obtained with water-cooling installations on six cupolas. (E10a, 1-2)

345-E. **Is CO_2 Necessary?** Carl E. Wulff. *Modern Castings,* v. 32, Aug. 1957. p. 28-29.

Small cores may be hardened by using dry nitrogen or dry compressed air instead of CO_2. (E21g)

346-E. **Technology for Casting Titanium.** G. H. Shippereit, R. M. L. Ang and J. G. Kura. *Modern Castings,* v. 32, Aug. 1957, p. 33-48. (CMA)

Ten years of titanium progress are reviewed. No titanium casting process is yet commercial, but research has covered many aspects of titanium casting problems. Various types of casting furnaces are surveyed. In general, machined graphite molds are best, but small parts have been made with expendable molds of powdered graphite or refractory oxides. The use of cerium sulphide crucibles appears promising although some loss of ductility in the casting occurs. (E general; Ti)

347-E. **Die Casting Aluminum and Zinc. Pt. 1.** *Modern Metals,* v. 13, June 1957, p. 72-91.

Growth of die casting industry, machine design, die design and construction. (To be continued.) (E13, 1-2; Al, Zn)

348-E. **Castings as Strong as Forgings.** Conrad A. Parlanti. *Product Engineering,* v. 28, June 1957, p. 170-174.

Use of anodized aluminum molds with controlled pouring rate is adaptable to large or small castings in aluminum, magnesium, cast iron and steel. Advantages and limitations are given. (E12, W19g, 17-7; Al, Mg, CI, ST)

349-E. **Air Setting Speeds Coremaking.** Daniel R. Chester. *Steel,* v. 141, July 22, 1957, p. 120-123.

Oil binder which oxidizes with air is used to develop green strength in sand. Advantages: fewer rods needed, reduced baking time, excellent collapsibility, accurate dimensions. (E21g, E18n)

350-E. **Welding and Related Procedures Encountered in a Modern Steel Foundry.** Samuel W. Gearhart, Jr. *Welding Journal,* v. 36, July 1957, p. 693-702.

Welding processes adopted in foundry to improve casting quality, simplify casting design; incorporation of castings in welded structures. Limitations and engineering aspects. (E general, K general, 17-1)

351-E. **Shell Cores Offer New Design Advantages.** Gordon Martin. *Western Machinery and Steel World,* v. 48, June 1957, p. 106-107.

Examples illustrate accuracy of interior surfaces of gray iron castings made with shell cores. (E16c; CI-n)

352-E. (German.) **Chemical Reaction in the Hearth of Melting Crucibles.** K. Wickert. *Brennstoff, Wärme, Kraft,* v. 9, Mar. 1957, p. 105-118.

Catalytic effect of solid, liquid and gaseous substances with regard to oxidation of SO_2 to SO_3; behavior of SO_2 and H_2S in oxidizing and reducing atmospheres; change in the chemical composition of catalysts; condensation point curve for H_2SO_4 as corrosion product of iron reaction with H_2S, SO_2 and SO_3/H_2O; quantitative comparison of corrosion of iron at various temperatures; investigation of chloride corrosion; analysis of hearth gases in different height furnaces; reaction between inorganic materials in solid state (coating and ashes); reaction between iron and solid substances. (E10; Fe, 14-10)

353-E. (German.) **Waterglass Molding Process. Pt. 3.** Siegfried Böhmer. *Giessereitechnik,* v. 3, Mar. 1957, p. 49-52.

Heating behavior of carbon dioxide

hardened waterglass solution; mixing, hardening of mold material, and its behavior on heating. 29 ref. (E19)

354-E. (German.) **Plastics for Patterns and Pattern Plates.** Otto Quappe. *Giessereitechnik,* v. 3, Mar. 1957, v. 57-60.

Properties and processing of organic plastics and pattern material developed in the German Democratic Republic; making of patterns and plates, and the use of pattern material. (E17; NM-d)

355-E. (Italian.) **Highlights of Progress in Steel Founding.** G. Blasich. *Fonderia Italiana,* v. 6, Jan. 1957, p. 3-7.

Résumé of world-wide technological developments in past ten years with reference to furnaces, refractory linings, molding methods. Brief description of Croning, lost wax, Shaw, "Mercast" and Schmidt and Phillips processes; characteristics of castings produced. (E general; ST)

356-E. (Italian.) **Qualitative Improvement of Cast Iron.** D. Fortino. *Fonderia Italiana,* v. 6, Jan. 1957, p. 8-15.

Possibility of using improved iron castings where steel has previously been specified on basis of indicated refinements in manufacture of gray, alloy, pearlitic malleable, spheroidal and high-alloy cast irons for special uses. Heat treatments for improving characteristics of iron castings. 5 ref. (E11, 2-14; CI, 17-7)

357-E. (Italian.) **Ten Years of Progress in the Founding of Nonferrous Metals.** E. Hugony. *Fonderia Italiana,* v. 6, Jan. 1957, p. 16-22.

Technological developments; chemical data and mechanical characteristics of castings made of nickel, aluminum, magnesium, lead, copper, tin, zinc and their alloys. References to several countries with special reference to Italian activity. (E general; EG-a38)

358-E. (Italian.) **Equipment for Treating and Controlling Clays.** T. LoRusso. *Fonderia Italiana,* v. 6, Feb. 1957, p. 54-56.

Components of a good molding clay mixture; plant and laboratory equipment required for efficient clay work. (E19; NM-f)

359-E. (Italian.) **Shell Casting.** M. Noris. *Fonderia Italiana,* v. 6, 1957, p. 57-58.

Developments during past ten years in technique of centrifugal casting of iron and nonferrous metals; brief description of Eaton process. (E14, E16c)

360-E. (Italian.) **Progress in Casting Finishing.** G. Pogatschnig. *Fonderia Italiana,* v. 6, Feb. 1957, p. 59-64.

Developments during past ten years; sand removal through heat treatment, finish cleaning and straightening. (E24)

361-E. (Italian.) **High-Quality Cast Irons and How to Produce Them.** Giorgio Giacomelli. *Fonderia Italiana,* v. 6, Apr. 1957, p. 149-151.

Three types noted: gray; high-strength (with subdivisions of high-quality gray and alloy cast irons); malleable. Structure of high-quality gray; manufacturing processes, including Lanz and Meehanite. (E11, Q general, M27; CI)

362-E. (Japanese.) **Degassification of Molten Aluminum.** Haruo Shimojo, Takaya Hiraoka and Eizo Shimizu. *Light Metals,* v. 7, May 1957, p. 51-59.

By holding molten metal for a certain time, the gas in the melt can be removed; gas content of the melt and the effect on gas cavities in the cast aluminum for various holding conditions measured by the specific gravity method. 8 ref. (E25s; Al)

363-E. (Russian.) **Casting of Large Steel Parts Using Blended Steel.** G. A. Ravitch and G. V. Morozkov. *Liteinoe Proizvodsvo,* no. 1, Jan. 1957, p. 1-3.

Casting techniques for castings up to 15 tons using various blends of electro and bessemer steel; chemical composition of the steels is tabulated. (E11; STT)

364-E. (Russian.) **Modernized Instruments for Testing of Mold and Core Sand Mixtures.** N. P. Dubinin. *Liteinoe Proizvodstvo,* no. 1, Jan. 1957, p. 8-9.

East German instruments for measurement of the sand mixture strength, gas permeability and fineness. (E18r, 1-3)

365-E. (Russian.) **Investigation of Cast Iron Desulpurization by Magnesium.** V. I. Lakomski. *Liteinoe Proizvodstvo,* no. 1, Jan. 1957, p. 9-11.

Kinetics and thermodynamic equilibrium of the magnesium and iron sulphide reaction. 4 ref. (E25, P12, CI, *S, Mg*)

366-E. (Russian.) **Increasing Temperature in Cupola Cast Iron Melting.** I. T. Garkusha. *Liteinoe Proizvodstvo,* no. 2, Feb. 1957, p. 18-20.

Description of the cupola processes in actual foundry practice; experimental melting; details of the cupola dimensions; temperature, coke usage and volume of air. 3 ref. (E10a; CI)

367-E. (Russian.) **Degasification of Aluminum Alloys by Direct Current Under Reduced Pressure.** V. G. Korotkov. *Liteinoe Proizvodstvo,* no. 2, Feb. 1957, p. 20-22.

The alloy density is discussed as a function of current density and vacuum at constant temperature. Higher current density and lower pressure give less porous castings. However, intermediate current density of 1 to 3 amp. per sq.cm. should be avoided. The experiments were repeated with varying temperature. Lower temperature gives less porous castings. (E25s; Al)

368-E. (Russian.) **Metallurgical Problems in the Centrifugal Casting of Pipes.** I. B. Khazan. *Liteinoe Proizvodstvo.* No. 4, Apr. 1957, p. 1-7.

Tubes cast centrifugally in metallic molds are often characterized by porosity, brittleness and poor corrosion resistance. Some of the latest centrifugal casting machines are designed along improved kinetic principles, but still are based upon concepts used in casting in earthen molds. Application of sound metallurgy would ensure better products. The influence of Si, C, Mn, P, S, Ti, Cr and Cu in the cast iron in different quantities is discussed. (E14, 2-10; CI, 4-10)

369-E. (Russian.) **Casting of Acid-Proof and Heat Resisting Alloys.** K. I. Vashchenko and L. I. Rostovtzev. *Liteinoe Proizvodstvo,* no. 4, Apr. 1957, p. 7-10.

To meet the increasing demand of chemical and petroleum refining industries, new acid and heat resisting alloys were developed. Previously corrosion resisting parts were forged or rolled but they now can be cast. Alloys with low chromium content may be used in place of expensive stainless steel. The chromium and carbon in these alloys are found in such carbides as $(FeCr)_7C_3$ and $(FeCr)_4C$. Nickel and molybdenum in noticeable quantities raise corrosion resistance of the alloys in reducing media. 5 ref. (E general, R general; SS, SGA-g, SGA-h)

370-E. (Russian.) **Shrinkage Porosity in Castings.** I. B. Kumanin. *Liteinoe Proizvodstvo.* no. 4, Apr. 1957, p. 18-23.

A molten mass first forms a skin along its outside surfaces; then by consequent cooling the entire mass solidifies. Since shrinkage near the skin is less intense than in the interior, voids are formed. These may be concentrated in temperature nodes, or dispersed through the whole casting. Experiments showed that volume of the voids, as well as porosity, is definitely related to certain portions of the phase diagrams. (E25n; 9-18)

371-E. (Russian.) **Shell Molds Produced by Chemical Hardening Method.** B. U. Feigelson. *Liteinoe Proizvodstvo,* no. 5, May 1957, p. 1-3.

Optimum conditions for shell mold production using sand, liquid glass and carbon dioxide. Factors influencing breaking, strain and hardening of the molds. Requirements for the composition of the liquid glass, quality of sand and organic additives. Mixing technique. 5 ref. (E19c)

372-E. (Russian.) **Steel Castings for Hydraulic Turbines.** I. D. Vasilev. *Liteinoe Proizvodstvo,* no. 5, May 1957, p. 5-10.

Composition and mechanical properties of the steel; rotor wheel mold and cores; sand mixture compositions; details of rotor and stator casting. (E11, W11n, 17-7; ST)

373-E. (Russian.) **Properties of Copper Alloy Castings Made by Lost Wax Process.** V. G. Baradanantz. *Liteinoe Proizvodstvo,* no. 5, May 1957, p. 10-12.

Superiority of the casting method over mechanical methods of copper alloy forming; method of pattern making; composition of seven alloys; properties of the castings as a function of the temperature. (E15; Cu)

374-E. (Russian.) **Perfection of Cast Iron Piston Casting Technology.** P. A. Karkhanin. *Liteinoe Proizvodstvo,* no. 5, May 1957, p. 12-14.

Description of the die and composition of the core mixing sand; advantages of slow cooling process; graphs show cast iron piston hardness and composition. (E11; CI)

375-E. (Russian.) **Apparatus for Adding Manganese to Cast Iron.** S. I. Rabukhov. *Liteinoe Proizvodstvo,* no. 5, May 1957, p. 14-15.

Description and the diagram of the apparatus; composition of the cast iron before and after the addition of manganese. Length of time of the process. (E22, W19m, 1-2; CI, *Mn*)

376-E. (Russian.) **Symmetry in Castings.** V. S. Kalabushkin. *Liteinoe Proizvodstvo,* no. 5, May 1957, p. 15-16.

Application of principles of symmetry to casting design. (E general, 17-1)

377-E. (Russian.) **Method of Fluidity Investigation.** A. M. Malachowski. *Liteinoe Proizvodstvo,* no. 5, May 1957, p. 16-17.

The investigation is divided into two parts: fluidity in castings of uniform and nonuniform cross section. Fluidity in the first group is determined by the height of the

metal cylinders along the path of the flow. In the second group glass molds are used and the casting is examined directly. The fluidity does not depend on consistency but traces of water or paraffin adversely affect filling properties. Glass mold method enables determination of the minimum of the cross section area of the mold. (E25p)

378-E. (Russian.) **Influence of Coke Properties Upon Melting Process of Cast Iron in the Cupola.** A. N. Strukov. *Liteinoe Proizvodstvo,* no, 5, May 1957, p. 17-20.

Influence of coke fineness, mechanical strength and reactivity upon cupola process efficiency, metal overheating, and fuel efficiency. (E10a; CI, RM-j43)

379-E. (Russian.) **Casting Density and Structure Uniformity.** A. A. Ryzlkov. *Liteinoe Proizvodstvo,* no. 5, May 1957, p. 20-22.

Mechanism of secondary, coaxial shrinkage flaws and porosity. Experiments with a vibration casting method, whereby almost defect-free castings are obtained. 3 ref. (E25n, E25q; 9)

380-E. (Russian.) **Metal Testing.** V. P. Tshernobrovkin. *Liteinoe Proizvodstvo,* no. 5, May 1957, p. 22-25.

A method and apparatus for testing castings by investigation of cooling, shrinkage and resistance curves. 3 ref. (E25n, 1-3, 1-4)

381-E. (Swedish.) **How Casting Design Influences Pattern Costs.** Alrik Ostberg. *Gjuteriet,* v. 47, no. 6, June 1957, p. 95-98.

Pattern costs are an important part of the price of castings produced in limited numbers. How a suitable design can help to simplify the pattern equipment for machine molding is shown. (E17, 17-1, 17-3)

382-E. (Swedish.) **The CO_2-Method in the Production of Medium-Sized Iron Castings.** E. Sabel. *Gjuteriet,* v. 47, no. 6, July 1957, p. 99-102.

The price of CO_2-sand is about the same as that of the oil-sand method. The most important advantage of the method is that no drying of the mold and the cores is needed. The best results have been reached with a soluble waterglass with low Baumé used in a relatively high percentage. (E18n; CI)

383-E. (Book—German.) **Chill Casting: Practical and Theoretical Handbook.** 331 p. 1954 VEB Wilhelm Knapp Verlag, Halle (Saale), East Germany.

Theory of chill casting; chill casting products; use of pig iron and scrap iron; smelting furnaces; casting and teeming methods; die casting; chilled roll iron; "GWK — 100x" rolls; hot rolling; wire rolling. Bibliography. (E general; CI, 5-16)

F Primary Mechanical Working

117-F. Cooling of Hot Steel Strip With Water Jets. A. Sigalla. *Iron and Steel Institute, Journal,* v. 186, May 1957, p. 90-93.

Two series of experiments have been undertaken on the cooling of hot steel strip, and their relevance to the design of strip cooling systems is discussed. It was found that rapid cooling can be achieved using simple water jets, and a formula is given from which the approximate number required can be calculated. 11 ref. (F23; ST, 4-3)

118-F. Modern Techniques in the Cold Reduction of Sheet and Tin Plate. E. N. Archibald. *Iron and Steel Engineer,* v. 34, May 1957, p. 141-146.

Operation of five-stand tandem, four-high cold reduction mill for production of steel sheet and plate; example of screwdown and tension adjustment and control; note on rolling lubricant, automatic ultrasonic testing for defects, screwdown and radioactive radiation thickness gages. (F23, 1-17, W23c, 1-2; ST, *Sn*)

119-F. Latest Techniques in Extruding Aluminum. Charles H. Wick. *Machinery,* v. 63, June 1957, p. 166-170.

Extrusion on 2750-ton capacity oil-hydraulic presses at Kaiser. (F24, 1-2; Al)

120-F. Titanium Tubing. T. M. Krebs. *Metal Progress,* v. 72, July 1957, p. 82-87. (CMA)

Seamless titanium tubing is available in a wide range of sizes in A-40, A-55 or A-70 grades with extruded and ground or machined surfaces or cold finished. Welded and cold finished tubing is also available. Alloy tubing may be obtained in the extruded and heat treated condition. The outstanding resistance of titanium to many chemicals, such as chlorides, indicates a large future use in the chemical and process industries. (F24, F26, T general; Ti, 4-10)

121-F. Steel and Titanium Extrusions. F. T. Roberts, Jr. *Society of Automotive Engineers, Journal,* v. 65, June 1957, p. 75-77. (CMA)

Titanium and steel alloys are now being extruded on a production basis for aircraft. Titanium extrusions are found in the McDonnell F-101 and in North American missiles. The configurations are usually angles, H's, tees and similar simple designs, and lengths up to 20 ft. have been formed. Shorter lengths are preferred because contact with the die surface should be minimized to keep the tool from overheating. The area of cross section and the gross weight are functions of the length and the weight of metal in the billet. Butt discard and front and rear-end scrap must be considered. Most common and exploratory alloys of titanium may be extruded, but optimum fabricating practices must be established for the higher alloys. Unusual shapes are expected in the future. (F24; ST, Ti)

122-F. Lubrication: A Study of Its Actions in Continuous Metal Deformation. Pt. II. L. H. Butler. *Steel Processing,* v. 43, June 1957, p. 326-333.

Bulk plastic deformation with no lubricant or very thin films, discontinuous films and continuous films. The establishment, maintenance and limitations of lubricant films. (F general, G general, 18-23)

123-F. (German.) **Graphic Representation of the Drawing Process on Non-slip Multiple Wire Drawing Machines.** F. Kowalski. *Draht,* v. 8, Mar. 1957, p. 77-80.

Mathematical calculations and graphic representation of various factors involved in the use of multiple wiredrawing equipment. (F28, 1-2)

124-F. (German.) **Fabrication of Bright-Drawn Steel Bars in the United States.** Otto Andrieu. *Stahl und Eisen,* v. 77, June 27, 1957, p. 853-859.

Plant size, batch size and flow of work; machinery and work processes; conclusions to be drawn for German bright-drawing plants. (F27, 1-2; ST)

125-F. (German.) **Temperature Measurements in the Drawing of Steel Wire. Pt. II.** Werner Lueg and Karl-Heinz Treptow. *Stahl und Eisen,* v. 77, June 27, 1957, p. 859-867.

Test results obtained up to present; materials tested, testing equipment and execution of the tests; effect of the lubricant carriers and lubricants on the temperature; application of the temperature as related to the friction surface; change of the temperature with the length of the wire drawn; effect of carbon content, tensile strength and drawing rate on the temperature in the draw-hole. (F28, S16)

126-F. (German.) **Investigations on a Four-Cylinder Reversing Mill Stand for Cold Rolling Strip for Tinplate. Pt. I. Measurements to Determine the Power and Work Required and the Degree of Utilization.** Karl-Heinz Spiller. *Stahl und Eisen,* v. 77, June 27, 1957, p. 867-874.

Measurements carried out on reversing mill stands to increase their efficiency. Testing equipment, execution of the tests and their interpretation; materials tested; evaluation of the values recorded; mean rolling conditions as dependent on the material and on the number of passes; utilization of the current of the motors; load imposed on the Ward-Leonard converter and rolling work required; effect of the measurements on the improvement of the efficiency. (F23, W23c, 1-2; ST, *Sn*)

127-F. (German.) **Investigations on a Four-Cylinder Reversing Mill Stand for Cold Rolling Strip for Tinplate. Pt. II. Effect of the Rolling Force, Rolling Speed, Strip Tension and Amount of Lubricant Used on the Accuracy in Dimensions of the Cold-Rolled Strip.** Paul Funke. *Stahl und Eisen,* v. 77, June 27, 1957, p. 874-881.

Testing scheme for measuring the effect of different conditions of rolling on the strip thickness; materials tested and testing equipment; test results; effect of the rolling force, rolling speed, braking tension and the tension of the reel, as well as of the distribution of the lubricant on the thickness of the strip. (F23, W23c, 1-2; ST, *Sn*)

128-F. (German.) **How to Determine Forging and Finishing Periods.** Hans Haller. *Werkstatt und Betrieb,* v. 90, Apr. 1957, p. 227-232.

From the procedure and sequence of operations in hot working, the necessary work expenditure and its associated time for forging and upsetting are determined. Influence of form changing resistance, temperature, form changing speed and friction resistance are particularly considered. The fundamental forging period is deduced from the necessary work expenditure and the available efficiency of the hammer or press. (F22, 3-17)

129-F. Extrusion of Steel Using Glass as a Lubricant. Pt. 1. History and Theoretical Principles. *Iron and Coal Trades Review,* v. 174, May 24, 1957, p. 1193-1197.

Basic principles, advantages and applications of the steel extrusion process; operating procedures; selection of lubricant. Results of re-

search undertaken by Jacques Sejournet at the Acieries Electriques d'Ugine. (F24; ST, NM-h)

130-F. Titanium Extrusion. Pt. 2. A. M. Sabroff and P. D. Frost. *Modern Metals,* v. 13, July 1957, p. 52-54, 56, 60, 62, 64. (CMA)

Either cast or forged billets of titanium are satisfactory for extrusion. A smooth finish and an outer edge that has been chamfered or radiused are recommended. In heating, the billets should be kept scale-free, for example by immersion in a salt bath. The advantages of induction heating are enumerated. Post extrusion processing is discussed. (F24, F21b; Ti)

131-F. Many Applications for "Tube-in-Strip". *Pipes and Pipelines,* v. 1, May 1957, p. 23-24.

New mill product in the form of a single strip, or sheet, of solid copper, brass or aluminum in which tubes are inflated to desired running lengths in a variety of shapes and sizes. (F26; Cu, Al)

132-F. Principles of a Metallurgically and Physically Balanced Hot Strip Mill. M. Alexander Leishman. *Proceedings of the 64th General Meeting of the Iron and Steel Institute,* 1956, p. 151-170.

Analysis of components of rolling system of hot strip mill established relationships between some of the following factors: temperature of furnace soaking zone, rolling time and roughing, entry temperature into strip mill, finishing speed, gage, finishing temperature and length of coil. Enables optimum coil length and weights to be calculated for metallurgically balanced operations. (F23; ST, 4-3)

133-F. Steelwork by Automation. *Scope,* v. 5, May 1957, p. 40-45.

Application of transfer techniques to the production of structural steel at Sanders and Forster Ltd., Stratford, England. (F27, 18-24; ST)

134-F. (German.) Nomographs for Drawing Power and Power Requirements for Wiredrawing. *Draht,* v. 8, June 1957, p. 203-208.

Detailed calculations and straight line charts for wire drawing. 5 ref. (F28)

G Secondary Mechanical Working

Forming and Machining

273-G. Hot Dies Make A-110-AT Titanium Behave. B. C. Kimbell. *American Machinist,* v. 101, July 15, 1957, p. 128-129. (CMA)

A-110AT may be drawn into cups by using a die designed by Worcester-Pressed Steel. Slow drawing speeds and heated dies are required. The die developed consists of a draw ring of pearlitic iron cast around heating elements, a Supermica 500 washer, and a horseshoe-shaped base. (G4c, W24n, 1-2; Ti)

274-G. Drilling of 6Al-4V Titanium Alloy G. P. Campbell and A. Searle. *American Society of Mechanical Engineers, Preprint 57-SA-71.* Apr. 8, 1957. 7 p. (CMA)

Tests to discover recommendations for drilling of Ti-6Al-4V. Very sharp cutting edges are required. Fine machine-ground points give more holes per grind than rough or hand-ground drills. Drills should be changed at the first sign of dulling; rotation of the drill without cutting causes rapid dulling. Speeds of 20-30 sfm. give the best tool life for drills of the M-10 and M-36 alloy steel type. The short NAS 907, Type-C drill is best for sheet. Drill geometries are also recommended. Axial thrust forces are high for titanium. (G17e; Ti)

275-G. Automation Aids Steel Cabinet Forming. H. R. Neighbours. *Automation,* v. 4, June 1957, p. 94-96.

Description of automation applied to press operations at the Whirlpool-Seeger plant in the manufacturing of laundry dryer cabinets. (G1, 18-24; ST)

276-G. Stretching and Drilling Techniques for the Jet Age. Ray Ortiz. *Machinery,* v. 63, June 1957, p. 155-157.

Description of a special drilling machine and a radial draw former which will be used in stretch-forming stainless steel and titanium for jet sections and parts. (G9, G17e, 1-2; SS, Ti)

277-G. Heat—the Key to Forming Titanium. E. A. Wooden and T. P. Iodice. *Machinery,* v. 63, July 1957, p. 154-159. (CMA)

Martin Co. (Baltimore) forms titanium parts with small radius bends and intricate contours without fear of fracture or distortion by controlled heating. One method uses individual blocks to raise the temperature of the work; 50 to 100 such blocks of individual design are used to produce the P6M Seamaster; heating units are built in. Facilities for 15 units are provided by the control panel. Temperatures as low as 300-400° F. have proved adequate in stretch-forming. In drop-hammer forming the titanium workpiece is resistance heated; the die surface is electrically insulated with liquid cement. Forming operations. (G9, F22n, F21b; Ti)

278-G. Titanium Formed at Ford by Heating, Rolling, and Exploding. C. H. Wick. *Machinery,* v. 63, July 1957, p. 184-189. (CMA)

Techniques for forming titanium for jet engine parts. Inlet guide vanes are formed from titanium blanks with an electrical resistance-heated die, seam welded and finish formed by explosion restriking. Details of the latter procedure are described. Heated upset blanks are roll-forged to compressor blades on a modified vertical hydraulic press. (G23, G11; Ti)

279-G. Milling With Chemical. Gilbert C. Close. *Metal Products Manufacturing,* v. 14, June 1957, p. 46-48, 91.

Advantages of "chemical milling" process are: parts can be formed and heat treated prior to milling; several parts can be chemically milled at one time; shapes can be milled chemically that would be impossible to mill by any known conventional set up. (G24b)

280-G. Electrical Discharge Form Grinding Carbide-Tipped Broaches. Ping Ianitelli. *Modern Machine Shop,* v. 29, May 1957, p. 114-115.

Carbide-tipped form broach machined to size by electrical discharge method. G24a, T6n; 6-19)

281-G. Working Pressures for Drawing Operations. *Production,* v. 39, June 1957, p. 111.

Chart based upon a free draw with no ironing and burnishing and upon a maximum reduction (nearly 50%). (G4, 3-24)

282-G. Hot Finish-Forming. J. L. Bayer and W. W. Wood. *Product Engineering,* v. 28, July 1957, p. 146-149. (CMA)

Hand-working titanium into shape is expensive because of poor resistance to buckling and forming. Stress-relief is therefore needed to control the final shape and to remove residual stress and the drop in compression yield strength subsequent to stretch forming. Chance-Vought has developed a hot-forming method to eliminate these difficulties, based on the use of electrically heated (to 950° F.) marinite-insulated dies. Either standard or special presses are used and several different dies may be accommodated at once. The cycle is 2-min. dwell time before and 3-min. after clamping, and 1 min. for reloading. Parts formed are categorized as single-stage forming from flat blank, two-stage forming from straight section, and three-stage forming from curved section. A formability chart shows where stress-relief is needed. (G1, 1-2, 1-16, Q23q; Ti)

283-G. Flaring of Zirconium End Adapters. A. J. Ciancetta. *U. S. Atomic Energy Commission,* KAPL-M-RCD-30. 7 p. (CMA)

A zirconium end adapter is flared in two operations, first with a 20° die and later with a 47° die. Requirements of finish, wall thickness and annealing are set forth. Study shows that the adapter design under consideration can be flared satisfactorily. (G6d, T11, 17-7; Zr)

284-G. (French.) Something New—One-Operation Impact Extrusion With the Comocast Casting Machine. D. Y. Gastoué. *Revue de L'Aluminium,* no. 243, May 1957, p. 540-541.

To further improve the exceptional low-cost possibilities of impact extrusion, efforts have been aimed at obtaining the slugs as economically and quickly as possible with a high-grade metal. In this field, a new machine, the Comocast, has just been introduced on the U. S. market. This machine, due to special tooling, casts the slugs under excellent conditions. G5, 1-2)

285-G. (French.) Industrial Possibilities of Impact Extrusion. Maurice Victor. *Revue de L'Aluminium,* no. 243, June 1957, p. 535-540.

Impact extrusion, either inverted or with the Hooker direct process, provides the possibility of producing economically and at a fast rate not only collapsible tubes, but also mechanical parts which can be both large and intricate and even embody inner walls or tubes. (G5)

286-G. Continuous-Dress Grinding. Anderson Ashburn. *American Machinist,* v. 101, May 6, 1957, p. 113-115.

Combination of diamonds in a roll and special hydraulic feed make it possible to dress wheels while they are grinding for a new level of automation. (G18)

287-G. Progress Report on Tapered-Skin Belt Grinder. Joseph R. Burns. *American Machinist,* v. 101, June 17, 1957, p. 130-133.

Units of 250 hp. for finishing flat and tapered aircraft skins have been used for finishing aluminum skin and plate, stainless steel sheet, cast steel boiler plate, titanium, magnesium and other parts. (G18k, 1-2; Al, SS, ST, Ti, Mg)

288-G. Analysis of Residual Stress in Ground Surface of High-Temperature Alloys. R. D. Halverstadt.

American Society of Mechanical Engineers. Paper no. 57-Sa—62, 12 p.

Residual stress caused by grinding high-temperature alloys has proved to be a troublesome problem both from a standpoint of distortion of the parts and from reduced endurance limits. A complete analysis was made which measured the effect of grinding-wheel speed, grinding-wheel hardness, grinding fluid, down feed, and work speed on the residual-stress level in the surface of three alloys used in modern aircraft gas-turbine design. The results of the study show that stresses can be minimized by using lower wheel speeds and down feeds, increasing work speed, and using a sulphurized oil as the grinding fluid. 6 ref. (G18k, Q25h; SGA-h)

289-G. Shear-Zone Temperature in Metal Cutting and Its Effects on Shear-Flow Stress. Dimitri Kececioglu. *American Society of Mechanical Engineers,* Paper no. 57-Sa—70, 7 p.

Relationships are given from which the mean shear-zone temperature in oblique, as well as in orthogonal cutting, can be calculated. The mean shear-zone temperature, developed when machining SAE 1015, 118 Brinell seamless steel tubing under a wide range of cutting conditions, is calculated and is found to vary from about 410 to 840° F. The effect of the mean shear-zone temperature on the mean shear-flow stress is studied. (G17k, 1-11; CN)

290-G. Making and Polishing Stainless Steel Automobile Roofs. *Automotive Industries,* v. 117, June 1, 1957, p. 56-57.

Major part of the roof panel is formed from 72-in. wide sheets of AISI Type 302 stainless. Two extensions or ears are gas welded to the main panel. (G1, T21a; SS)

291-G. Stainless Steel. Pt. 2. Drilling. J. A. Ferree. *Automatic Machining,* v. 18, June 1957, p. 64-66.

Information on equipment, drill preparation and design, drilling lubricant, drilling speed for several stainless steels. (G17e; SS)

292-G. Castings Machine Better With Water Coolants. W. G. Patton. *Iron Age,* v. 179, June 20, 1957, p. 102-103.

Water soluble coolants are advantageous from the standpoint of economy, cleaner plant and easier chip disposal. (G17; MN-h, 5)

293-G. Tips on Machining Stainless. *Iron Age,* v. 180, July 25, 1957, p. 114-121.

Whether the job involves turning, drilling, tapping, milling or reaming, pointers are given which will make the job easier and more efficient. (G17; SS)

294-G. Machining Standard Steels. *Iron Age,* v. 180, July 25, 1957, p. 122-128.

Techniques to achieve high quality consistent with lowest price. (G17; ST)

295-G. Operations on Body Components for Ford Consul, Zephyr and Zodiac Cars. *Machinery,* v. 90, May 24, 1957, p. 1158-1166.

Operations and machines used in forming, drawing, spot and seam welding of steel sheets for front fenders of British Fords. (G1, G4, K3n, K3p, 1-2, T21a; ST)

296-G. Results Obtained With High-Rake Milling Cutters. J. R. Varnak. *Machinery,* v. 90, June 7, 1957, p. 1269-1273.

High speed steel milling cutters with high-rake angles make possible increases in speed and feed in slotting for plain slab milling provided ample coolant is supplied; experiments on SAE 8620, SAE 4815, SAE 4140 steels and bronze.
(G17b, 1-2; AY, Cu-s)

297-G. Broaching Titanium. L. B. Gray. *Machinery*, v. 63, Aug. 1957, p. 135-141. (CMA)

Broaching, often considered the most troublesome operation in machining titanium, has been easily performed at Orenda Engines with carefully designed broaches made from 18-4-1 high speed steel. Solid-type broaches are used for roughing and the insert type for finishing. (G17d, 1-2; Ti)

298-G. Metalworking by Spark-Erosion. Pt. 1. *Metalworking Production*, v. 101, June 21, 1957, p. 1067-1071.

Practice and theory with particular emphasis on Agietron method, which is expained with reference to other known methods. (G24a)

299-G. Machining Properties of Iron Castings. Norman Zlatin, W. H. Friedlander and Charles F. Walton. *Metalworking Production*, v. 101, July 12, 1957, p. 1201-1208.

Effect of microstructure on tool life; factors influencing surface finish and causes for distortion.
(G17k, 3-21; CI)

300-G. A Two Component Lathe Dynamometer. B. L. Ten Horn and R. A. Schurmann. *Microtecnic*, v. 11, no. 2, 1957, p. 59-66.

Machinability evaluation based on cutting forces. Describes a two-component dynamometer giving both the main and tangential force component and the feed or axial force component. (G17k, 1-4)

301-G. New Light on Grinding Fluids. *Steel*, v. 141, July 15, 1957, p. 127-136.

Research at Mellon Institute indicates that lubrication is more important than cooling. Grinding experiments were done in air, two concentrations of rust inhibitor in water, six water soluble oils and four straight grinding oils. (G18, NM-h)

302-G. Turk's-Heads Shape Production Parts. *Steel*, v. 140, June 17, 1957, p. 104-106.

Operating like small rolling mills, these adjustable arrangements of rolls shape variety of cross sections from wire and strip of a large range of materials including high-alloy and toolsteels and titanium.
(G11; AY, TS, Ti, 4-3, 4-11)

303-G. Impact and High-Velocity Forming. R. W. Peters. *Tool Engineer*, v. 39, July 1957, p. 83-86.

Note on possibility of shot forming aluminum, stainless steel and titanium with explosives.
(G general, 1-2; Al, SS, Ti, NM-k34)

304-G. Cold Forming Improves Tubular Parts. William J. Sprigings. *Tool Engineer*, v. 39, July 1957, p. 116-118.

Cold forming of thin-wall stainless steel tubing for use in aircraft components found more simple than halfshell stamping and welding methods of manufacture.
(G general, 1-17; SS, 4-10)

305-G. Methods and Procedures for Special Tube-Bending Applications. R. J. Reardon. *Western Machinery and Steel World*, v. 48, June 1957, p. 108-109.

Techniques in bending tapered or swaged tubing. (G6; 4-10)

306-G. Mechanism of Action of Lubricants in the Working of Metals. S. Ya. Veiler, V. I. Likhtman and P. A. Rebinder. *Doklady Akademii Nauk*, v. 110, 1956, p. 985-988. (*Henry Brutcher Translation* no. 3943).

Action of lubricants in metalworking in terms of reduction of thickness and build-up ("plastic wave") in front of the tool, and of rendering surface layers more amenable to plastic deformation. Specific advantages of surface-active lubricants in regard to their action on surface of metal, its elastic recovery, stress state and surface quality.
(G general; NM-h)

307-G. (French.) **Machining of Copper and Copper Alloys. Pt. 3 and 4. General Practice of Machining. (Continued.)** *Cuivre Laitons Alliages*, no. 37, May-June 1957, p. 7-14.

Functions served by cutting fluids; enumeration of various types; their application and factors determining their selection; turning, surfacing, profiling, milling of copper alloys; lathes and equipment employed.
(G17, 1-2; Cu, NM-h)

308-G. (German.) **Reducing by Cold Drawing.** H. Gross and R. Beck. *Fertigungstechnik*, v. 7, Feb. 1957, p. 57-62.

Forming methods; limits of formability by reducing; effect of shape; properties of material; notch effect; sheet clamping and clamping angle; friction; reducing tools; simple and multiple hydraulic drawing presses; special reducing machines. 49 ref.
(G4, 1-17)

309-G. (German.) **Shaping of Sheet Steel With the Aid of Rubber.** H. Gross and R. Beck. *Fertigungstechnik*, v. 7, Mar. 1957, p. 115-119.

Basis for rubber methods; comparison with other process; requirements for shaping with rubber; Guerin, Marform, hydroform deep drawing, Hidraw and Wheelon methods. 55 ref. (G14; ST, 4-3)

310-G. (German.) **Photometric Determination of Arsenic in Commercial Iron With Silver-Diethyl-Dithiocarbamate.** Z. Vecera and B. Bieber. *Giessereitechnik*, v. 3, Mar. 1957, p. 61-64.

Basic method, apparatus, solutions and reagents, plotting of calibration curve. 6 ref. (S11a; Fe, *As*)

311-G. (Japanese.) **Durability of Drills in Machining High-Quality Cast Iron.** Makoto Okoshi, Naoharu Kinoshita and Takao Sakuma. *Scientific Research Institute, Reports*, v. 33, no. 3, May 1957, p. 124-136.

Determination of durability; effect of pressure; cutting speed; comparison of types of drills. (G17e, 1-2; CI)

312-G. (Russian.) **Introduction to Ceramic Tools.** O. E. Gelfand and S. B. Futorian. *Vestnik Mashinostroeniia*, v. 37, Apr. 1957, p. 50-56.

Methods of holding ceramic bits in lathe tools and in milling cutters. Extensive data are furnished on their application and performance.
(G17, T6n, 17-7; 6-20)

313-G. (Russian.) **Method for Calculating Temperature Produced by Grinding.** A. I. Isaev and S. S. Silin. *Vestnik Mashinostroeniia*, v. 37, May 1957, p. 54-59.

By calculations developed in this article it is possible to avoid high temperatures in grinding operations which are likely to produce burring, cracks and residual tension.
(G18, 2-12)

314-G. (Russian.) **Working Hard Alloys by Electro-Abrasive Means With Graphite Filling.** I. K. Trushin. *Vestnik Mashinostroeniia*, v. 37, May 1957, p. 59-61.

This method is cheaper and as satisfactory as that produced by the use of ceramic, carbide and diamond. A rotating wheel is impregnated with graphite, and this is the cathode; the anode is a film formed by the electrolyte on the surface of the work. Gages made by this method have surfaces with mirror finish. (G24d)

315-G. (Russian.) **The Effect of Grinding on the Strength of Heat Treated Parts.** D. C. Elenevski. *Vestnik Mashinostroeniia*, v. 37, May 1957, p. 65-69.

A study of the effect of grinding on various test pieces. It is recommended that those portions of the work which are most likely to be weakened by grinding should be ground before heat treatment. In the event that this is not feasible, grinding should be held to a minimum by precise machining.
(G18, Q27a; 14-18)

H Powder Metallurgy

56-H. New Horizons in Powder Metallurgy. Cord H. Sump. *Metal Progress*, v. 72, July 1957, p. 95-96, 116, 118.

Production of nickel and copper powders from low-grade raw materials; compacting of powder between rolls into strip; manufacture of felts from metallic fibers; rapid sintering activated by volatile salts in the compact. (H general)

57-H. (German.) **Influence of Pre and Post-Pressure and Sinter Temperature on Properties of Sintered Parts Manufactured From Metal Powders.** Gerhard Bockstiegel. *Archiv für das Eisenhüttenwesen*, v. 28, Mar. 1957, p. 167-177.

Specific weight, tensile strength, elongation prior to rupture, electrical conductivity and post-pressability of sintered samples of four powder metals produced either by reduction, electrolytical or mechanical crushing, and their dependence upon pressure (3 to 9 tons per sq. cm.) and sinter temperature (to 1250° C.). 16 ref. (H15p)

58-H. (German.) **Sintering in a Liquid Phase.** F. Eisenkolb and I. Kaining. *Planseeberichte für Pulvermetallurgie*, v. 5, Apr. 1957, p. 2-19.

Study of the mechanism of liquid-phase sintering using radioactive methods for determining the coefficients of self-diffusion, and comparing values obtained with those obtained by Kuczynski, *et al.* The effect on the sintering rate of inorganic salts or molten metals as the liquid phase; characteristic surface reactions which govern the rates of material transport, as opposed to the concept of self-diffusion as the governing process. 27 ref. (H15, N1d)

59-H. (Japanese.) **Aluminum Powder and Its Applications.** S. Imamura. *Metals*, v. 27, June 1957, p. 449-453.

Manufacture of aluminum powder; graining, atomizing, stamping and

ball milling. Physical properties of aluminum powder—shapes, specific gravity, leafing properties, stability at various temperatures; applications. 3 ref.
(H general; Al, 17-7)

60-H. (Japanese.) **Vacuum Sintering.** Soichiro Asao. *Metals,* v. 27, June 1957, p. 493-498.

Atmospheres of sintering furnaces; furnace design; vacuum sintering of tantalum, titanium, zirconium and beryllium. 13 ref.
(H15q, 1-23, W26e; Ta, Ti, Zr, Be)

61-H. Production and Applications of Aluminum Powders and Pastes. *Metal Finishing,* v. 3, July 1957, p. 289-292, 298.

Early production methods; modern methods employed by Reynolds Metals. (To be continued.) (H10; Al)

62-H. Carbides, Carbide Components and High Vacuum Techniques. Peter Trippe. *Metalworking Production,* v. 101, May 3, 1957, p. 751-755.

Methods used in production and ball milling of tungsten carbide powder wax milling, green machining, pressing and high-vacuum sintering of components made from tungsten carbide or titanium carbide. (To be continued.)
(H general, 1-23; W, 6-19)

63-H. Submicron Metal Powders Make Sintered Parts as Strong and Dense as Solid Metal. M. W. Freeman and John H. L. Watson. *Product Engineering,* v. 28, June 1957, p. 182-184.

Iron, copper and nickel powders have been alloyed with each other and chemically combined with nylon, rubbers and other elastomeric materials and are at present being produced by electrolytic process on a pilot-plant scale. Submicron powders, of particle size as fine as in tobacco smoke, have strong interparticle bonding.
(H10b, H16d, H12)

64-H. Preparation of Spherical Uranium Powder by Reduction of Uranium Trioxide With Calcium. A. P. Beard and F. K. Heumann. Knolls Atomic Power Laboratory. *U. S. Atomic Energy Commission,* KAPL-1380 (Del.), July 22, 1955, 32 p.

The reduction of uranium trioxide with calcium is a feasible technique of producing spherical uranium particles, which are of interest in development of long-lived fuel elements consisting of these particles dispersed in a ductile, nonfissionable metal or alloy. 14 ref.
(H10c; U)

65-H. Alumina-Base Cermets. Pt. 2. C. A. Hauck, E. W. Deadwyler and T. S. Shevlin. Ohio State University Research Foundation (Wright Air Development Center). *U. S. Office of Technical Services,* PB 121253, Mar. 1956, 44 p. $1.25.

Unsuccessful attempts to bond the ceramic oxide aluminum and five different metallic alloys for the purpose of developing cermet compositions possessing a high level of impact resistance with an adequate high-temperature strength and oxidation resistance. The major obstacle to the development and evaluation of alumina-base cermets containing the metals iron, nickel and cobalt is the unsolved problem of devising a means of promoting wetting between them.
(H general; Al, 6-20)

J Heat Treatment

165-J. Annealing of Point Defects in Cold-Worked Molybdenum. D. G. Martin. *Acta Metallurgica,* v. 5, no. 7, July 1957, p. 371-376. (CMA)

A study of changes in the electrical resistance of cold worked molybdenum effected by annealing up to 400° C. showed that a point defect from cold worked anneals at 150° C. with an energy of migration of 1.26 ev. A relaxation of dislocations is presumed over a broad spectrum of activation energies. Iosthermal annealing curves do not have identical shapes. Estimating the number of defects on the basis of energy release on annealing is discussed.
(J23, P15; Mo, 9)

166-J. Rapid Stress Relieving of Titanium Parts Without Distortion in New Car-Bottom Furnace. W. L. Timm. *Industrial Heating,* v. 24, June 1957, p. 1120-1122. (CMA)

Convair operates a car-bottom furnace which reduces the loading and unloading time entailed in stress-relieving titanium aircraft parts. Sheet is also straightened and warping is prevented. The furnace and its operation are described.
(J1a, W27, 1-2; Ti)

167-J. Study of Factors Influencing Surface Staining of Cold Rolled Steel. Pt. 1. Types of Defects and Their Occurrence. C. R. Lillie and D. W. Levinson. *Iron and Steel Engineer,* v. 34, May 1957, p. 69-73.

Considers and analyzes surface defect appearing on cold rolled steel strip known as "snaky edge"; determinations on effect of time, temperature, gas compositions, gas flow on surface staining during annealing; adjustment of annealing conditions to remove "snaky edges" produced commercially. (J23; SS, 9-21)

168-J. Study of Factors Influencing Surface Staining of Cold Rolled Steel. Pt. 2. Reaction Mechanism of Black Stain Formation on Annealed Steel Coils. F. V. Schossberger, K. Hattori and H. Marver. *Iron and Steel Engineer,* v. 34, May 1957, p. 74-81.

Laboratory study of the influence of DX gas and rolling oil on the formation of black edge. Effects of gas composition, gas flow, temperature and gap between steel sheets; black edges obtained from steel mills analyzed by electron and X-ray diffraction. 13 ref. (J23; SS, 9-21)

169-J. Hydrogen Control in Titanium. *Steel,* v. 141, July 1, 1957, p. 82. (CMA)

Martin Co. (Baltimore) saves time and money by subjecting titanium to a vacuum fusion analysis before using it in production to detect excess hydrogen. The procedure is described. The excess hydrogen may be removed by a vacuum annealing treatment. The Steel Improvement & Forge Co. (Cleveland) uses chemical analysis for hydrogen control.
(J23, 1-23, S11r; Ti, *H*)

170-J. (German.) **Carburizing Effect of Various Carburizing Materials.** Karl Heinz Kopietz. *Harterei-Technische Mitteilungen,* v. 10, no. 1, 1956, p. 9-37.

Effect of recarburization; carburization materials and their effect; carburization values, activity, process; four recarburizing methods and customary additives; control methods; effect of carbide formed in steel on the carburization curve. 26 ref.
(J28g)

171-J. (German.) **Grain Boundary Damage of a Cr-Ni-W Steel as a Consequence of Overheating.** Jerzy Ogerman. *Neue Hütte,* v. 2, May 1957, p. p. 289-299.

Influence of elevated heating temperatures (1200 to 1350° C.); heating time and cooling rate; degree of deformation and state of heat treatment upon the rupture appearance of a Cr-Ni-W steel. Grain boundary damages of steel at an annealing temperature up to 1250° C.; notched bar impact toughness of longitudinal test pieces at room temperature; ground section development of typical grains of the overheated state and new electrolytical etching method; interpretation of the causes of grain boundary damage. 32 ref.
(J general; AY, 9-23)

172-J. (German.) **The Problem of the Life of Lead Bath Pots.** Hans Krautmacher and Wilhelm Pungel. *Stahl und Eisen,* v. 77, June 27, 1957, p. 837-845.

Materials tested, preliminary tests and test practice; corrosion rate as dependent on the annealing time and temperature; effect of the condition of material; service tests; annealing of plain carbon and alloy steels at a temperature of the lead bath of 720° C. for more than 300 hr. (J2j, 17-7; CN, AY, Pb)

173-J. (German.) **On the Use of Generator Gas as an Inert Gas in the Heat Treatment of Steel.** R. Meyer and F. Pawleck. *Werkstatt und Betrieb,* v. 90, Apr. 1957, p. 217-225.

Properties necessary and the suitability of generator gas are investigated; details of processing and economical use under various service conditions. 15 ref. (J2k; RM-g)

174-J. (German.) **Possibilities of High-Frequency Heating.** H. Grassmann and G. Meiners. *Werkstatt und Betrieb,* v. 90, Apr. 1957, p. 245-248.

The industrial high-frequency technique is a heating method which, through its extremely short-time requirements, can contribute to a rationalization of production. Industrial applications. (J2g)

175-J. (Japanese.) **Some Experiments on Residual Stress Relieving.** Akira Takaoki. *Iron and Steel Institute of Japan, Journal,* v. 43, Apr. 1957, p. 481-484.

In large forgings, such as for turbine rotors, it is important to relieve the residual stress. Stress-relieving experiments were studied by the Sachs' boring-out method. The specimens (70 mm. diameter, 210 mm. long) were quenched in water from just below Ac_1 transformation temperature, and then reheated at various temperatures and for varying periods of time. (100 to 600° C., 1 to 90 hr.). 3 ref.
(J1a; ST, 4-1)

176-J. (Japanese.) **Annealing of Extruded Aluminum Rod.** Yoshikazu Hosoi, Eiichi Sawato and Mamoru Yukawa. *Light Metals,* v. 7, May 1957, p. 65-69.

The annealing curve for a pure aluminum specimen extruded at high

temperature is similar to that for cold worked aluminum. The softening point varies according to the annealing method. Investigation of the hardness and electrical resistance of the specimens indicated that recrystallization took place during annealing, but X-ray diffraction patterns and microstructure did not clearly reveal that recrystallization resulted. 7 ref. (J23, N5; Al, 4-8)

177-J. (Norwegian.) **Heat Treatment of Aluminum Alloys.** R. Veimo. *Tidsskrift for Kjemi, Bergvesen og Metallurgi,* v. 16, no. 10, 1956, p. 189-198.

Heating in preparation for plastic forming; soft heating and partial annealing; homogenizing, precipitation, and stabilizing heat treatment. (J general; Al)

178-J. (Russian.) **Influence of Tempering Temperature Upon the Form of Graphite Inclusions in Malleable Cast Iron.** G. I. Ivantzov. *Liteinoe Proizvodstvo,* no. 5, May 1957, p. 25-26.

Tempering results at six different temperatures. 5 ref. (J23b, 2-11; CI-s)

179-J. Effects of Acoustical Waves on the Annealing of Steels. H. V. Fairbanks and F. J. Dewee. *Acoustical Society of America,* v. 29, May 1957, p. 588-592.

Investigation to determine effect of ultrasonic energy on 0.07 and 1.05% carbon steels during transformation from austenite to ferrite under controlled cooling. The ultrasonic energy was produced by means of a bowl-shaped crystal of barium titanate and was coupled to the steel samples through distilled water. Ultrasonic frequencies of 400 and 1000 kc. were used. It was found that the ultrasonic treated samples of 0.07% carbon hypoeutectoid steel had finer grain size and greater hardness than the reference samples which had undergone the same heat treating cycle but no ultrasonic treatment. (J23; 1-24; CN)

180-J. Quench and Temper Process for the Manufacture of High Strength Tubular Products. H. B. Emerick. *Blast Furnace and Steel Plant,* v. 45, June 1957, p. 608-613.

A new continuous heat treating process economically raises mechanical properties of ordinary hot rolled tubular products to meet expanding market for tubular materials of superior strength. (To be continued.) 10 ref. (J26n, J29; ST, 4-10)

181-J. Quench and Temper Process for the Manufacture of High Strength Tubular Products. Pt. 2. H. B. Emerick. *Blast Furnace and Steel Plant,* v. 45, July 1957, p. 721-726, 738.

Continuous quench and temper line for production of high-strength oil well casing and possible other tubular products. 10 ref. (J26, J29, 1-11; 4-10)

182-J. Steam Atmosphere Heat Treatment. *Canadian Metalworking,* v. 20, June 1957, p. 50-52.

Typical applications in both ferrous and nonferrous field; advantages in improved wear, longer life, better machinability and greater corrosion resistance. (J2k; RM-g32)

183-J. Heat Treatment of Vehicle Transmission Gears. *Engineering,* v. 183, May 17, 1957, p. 619-620.

Specially designed heat treatment equipment capable of processing 1000 lb. of commercial vehicle transmission gears every 7 hr. (J general, 1-2, T7a)

184-J. Metallurgical Aspects of Induction Heating. Pt. 1. Harry B. Osborn, Jr. *Industrial Heating,* v. 24, June 1957, p. 1102-1116, 1254.

Theoretical principles. Relationships of factors influencing surface hardness of SAE 1045, or similar steels following heating by induction and spray quenching. Variables include frequency power density, prior structure of steel, diameter of steel, heating time, time between heating and quenching. (To be continued.) (J2g; ST)

185-J. Metallurgical Aspects in the Design and Operation of a Continuous Annealing Line. Pt. 2. A. F. Mohri. *Industrial Heating,* v. 24, June 1957, p. 1168-1178.

Data on effective soaking time, cooling time, annealing temperature, quenching temperature for annealing cycle of low-carbon steel strip to be used as tinplate; effect on hardness of steel strip of constituents that form a substitutional or interstitial solid solution. (To be continued.) (J23, 1-2, 1-11; CN, 4-3)

186-J. Heat Treating Facilities Expanded by California Doran Heat Treating Co. W. G. Thompson. *Industrial Heating,* v. 24, June 1957, p. 1264-1276.

Gas-fired radiant tube 3-zone pit loading tower furnace for heat treating work up to 15 ft. long and 48 in. in diameter, using automatically controlled endothermic generator gas atmosphere. Other units for controlled atmosphere heat treatment such as gas carburizing, dry cyaniding, carbonitriding and bright hardening. (J2k, W27g, 1-2)

187-J. Steam Treat Tools for Longer Shop Life. F. L. Spangler and M. E. Lackey. *Iron Age,* v. 179, June 27, 1957, p. 106-108.

Test results showing performance of machine tools, circular slotting saws and drills with regular surface finish or with oxide film formed by heat treatment in steam atmosphere. Hard porous oxide film from steam treatment gave improved performance. (J2k, T6n; Ts, RM-g32)

188-J. Continuous Normalizing and Heat Treating Equipment for Steel Plate. Horace Drever and N. K. Willis. *Iron and Steel Engineer,* v. 34, June 1957, p. 125-130.

Fully automatic continuous plate heat treating line includes charging transfer car, 145-ft. hardening furnace, pressure quench, quench transfer car, 200-ft. tempering furnace, conveyer tables, transfer cars, plate layout and test block cutting tables. The line is capable of handling plate up to 172 in. wide, 3/16 to 3 in. thick and 480 in. long if quenched, and 575 in. long if normalized and air cooled. (J24, J26, 1-2, 1-11; ST, 4-3)

189-J. Metallurgical Aspects in the Design and Operation of a New Continuous Annealing Line. A. F. Mohri. *Proceedings of the 64th General Meeting of the Iron and Steel Institute,* 1956, p. 123-149.

Hardness values are followed on low-carbon steel strip to determine relationship of temperature and time to hardness. Recrystallization temperature, effect of soaking time, maximum quenching temperature, effect of cooling time and effect of carbon, nitrogen, phosphorus, tin and molybdenum on hardness are determined and discussed and their contribution to the annealing cycle considered. 8 ref. (J23, 1-11, Q29n; CN, 4-3)

190-J. Vacuum Heat Treating Takes Hold. R. R. Giler. *Steel,* v. 141, July 15, 1957, p. 108-110.

Design and applications of a vacuum furnace for semicontinuous annealing at high temperatures. (J23, 1-2, 1-23)

191-J. New Methods of Heat Treatment and Surface Impregnation of Metals in Fused Salts. A. I. Zot'ev. *Vestnik Mashinostroeniya,* v. 35, 1955, p. 67-71. (*Henry Brutcher Translation* no. 3955).

Previously abstracted from original. See item 135-J, 1956. (J2, ST)

192-J. (German.) **Nitriding and Related Problems With Regard to Materials Used.** K. Bielau. *Fertigungstechnik,* v. 7, Mar. 1957, p. 103-111.

Temperatures and rate of absorption; alloying additions; surface hardening; nitriding methods; physical properties and increase in performance of nitrided steel. 22 ref. (J28k; ST)

193-J. (German.) **Case Hardening by Gas Carburizing.** W. Stuhlmann. *Fertigungstechnik,* v. 7, Apr. 1957, p. 153-160.

Preparation of the carburizing gas, its composition and influence on the carburizing results; the furnace installation and proper heat treatment of the material to be hardened; carbonitriding. (J28g, J28m, 1-2)

194-J. (German.) **Quench Hardening and Its Application to Toolsteel.** F. A. Treml. *Fertigungstechnik,* v. 7, May 1957, p. 194-202.

A description of the process with charts and tables. Advantages lie in absence of risks in hardening, easier workability of the steel, and increase in toughness and performance. (J26; TS)

195-J. (German.) **Limits of Oil and Water Quenching.** G. Pahl. *Fertigungstechnik,* v. 7, May 1957, p. 203-208.

Chemical composition of steels and their influence on depth of the hardening zone; cooling requirements; critical cooling speed; curves for water, oil and air cooling; time-temperature - transformation diagrams. 7 ref. (J28, N8g, W28p)

196-J. (German.) **Errors in Heat Treatment of Steels.** W. Küntscher and K. Werner. *Fertigungstechnik,* v. 7, May 1957, p. 209-212.

Errors in soft annealing in patenting, and in normalizing in specialized heat treatment processes. (J23, J24, J25)

197-J. (German.) **Induction Heating and Possibilities for Automation in the Hardening Process.** G. Hoffmann. *Fertigungstechnik,* v. 7, May 1957, p. 213-218.

A detailed description of medium-frequency heating (500 to 50 kc.), including calculations, illustrations, diagrams for the process and equipment used. (J2g, 1-2, 18-24)

198-J. (German.) **Experience in Operating an Automatic Induction Hardening Machine for Ball Bearing Rings.** A. Naumann. *Fertigungstechnik,* v. 7, May 1957, p. 218-221.

Description and evaluation of machine and explanation of process. (J2g, 1-2, T7d; ST)

199-J. (German.) **Usefulness and Limits of Induction Hardening. Pt. 1.** W. Barth. *Fertigungstechnik,* v. 7, June 1957, p. 251-257.

Induction hardening of steel; characteristics of the process (surface hardening, endurance limits); physi-

cal basis (induction heating, surface effect, depth involvement); material problems (carbon contents, normalizing, quality of raw materials, steel "C45"). (J2g; ST)

200-J. (German.) **Induction Surface Hardening of Cast Iron for Surface Guides in the Machine Tool Industry.** G. Benkowsky. *Fertigungstechnik*, v. 7, June 1957, p. 257-259.

Process used at the Hermann Schlimme plant, Berlin. Preheating, heating loop, material problems, depth of hardening, surface hardening; hardening temperatures, structure, distortion due to hardening and polishing after hardening.
(J2g, W25c, 17-7; CI)

201-J. (German.) **Heat Treatment of Roller Bearing Rings With Consideration of Resulting Distortion.** M. Smahel. *Fertigungstechnik*, v. 7, June 1957, p. 265-271.

Influence of size of the rings on the choice of heat treatment; choice of raw material and annealing process; influence of inner tensions after treating; influence of repeated hardening on distortion.
(J general, T7d; 9-24)

202-J. (German.) **Flame Hardening, a Means for Increasing Production Efficiency.** Jörgen Püschel. *Schweissen und Schneiden*, v. 9, June 1957, p. 279-280.

Considerable savings in weight can be obtained by increasing the permissible flank pressure for gear teeth from 30 to 60 kg. per sq. mm. Through the use of electronic operation and program control very high precision work by flame hardening machines is made possible. In the manufacture of compact wheels with small pitch the rotational gear hardening process has been successful. In this process, which is extremely economical, the wheel is externally heated and quenched in oil. (J2h, T7a)

203-J. (Polish.) **Production and Application of Controlled Furnace Atmosphere of Endothermic Type.** Jozef Goczal. *Hutnik*, v. 24, Mar. 1957, p. 92-99.

Types of furnace atmospheres and their application; plants for endothermic-type atmosphere production; methods of atmosphere composition adjustment and calculation; example of atmosphere selection for chromium steel heat treatment; conformity of the results with computations. 3 ref.
(J2k, W28q, 1-2; AY)

K Assembling and Joining

313-K. **Solders, Fluxes. Pt. 1. Types and Characteristics.** Frank J. Versagi. *Air Conditioning and Refrigeration News*, v. 80, June 3, 1957, p. 20-21.

Basic principles underlying soldering, brazing and welding; typical solders and brazing alloys. (To be continued.)
(K7, K8, K1, K2; SGA-f, RM-q)

314-K. **Rocket-Motor Tubes.** *Aircraft Production*, v. 19, June 1957, p. 222-230.

Application of argon-arc welding to high-strength steel sheets during the manufacture of rocket-motor boost units. The conclusion reached from this successful application of welding to high-performance structures is that welding and high-strength steels are not necessarily incompatible. (K1d; ST, SGB-a)

315-K. **Autoclave Bonding.** N. Evans. *Aircraft Production*, v. 19, June 1957, p. 240-249.

Methods of heating, tool design and some of the advantages, as well as the drawbacks of the autoclave curing technique; comparison with the usual press method. (K12)

316-K. **Assembling Housings in Automatic Welder.** *Automation*, v. 4, June 1957, p. 71-73.

Twelve-station dial indexing machine welds ten separate parts to shells which then are used as the upper halves of refrigerator compressor housings. Welding cycles are automatically timed and all machine functions interlocked by means of limit switches and relays.
(K1, 18-24)

317-K. **Manufacture of Mineral Insulated Cables.** *Engineer*, v. 203, May 24, 1957, p. 806-807.

Method consists in packing an insulating mineral powder such as magnesia to hold rod conductors inside a copper tube so that the whole assembly can be elongated by repeated drawing to produce a copper sheathed cable. (K13a; Cu)

318-K. **Making "M.I." Cables.** *Engineering*, v. 183, May 24, 1957, p. 649-650.

Fabrication of mineral-insulated (M.I.) cables. The powder used in magnesium oxide (magnesia) which has a very high insulating capacity, and is also a good conductor of heat. In the process, the initial tube of copper, 10 yd. long and 2 in. internal diameter, carriers within it up to seven copper conductors round which the magnesia is rammed.
(K13a; Cu)

319-K. **Investigation of Gouges, Arc Burns in Steel Line Pipe.** C. T. Schweitzer. *Gas*, v. 33, June 1957, p. 107-112.

A series of tests to evaluate the seriousness of gouges and arc burns in welding and to formulate methods of repairing them. Types of tests used; analysis of results. (K1, 9-21)

320-K. **Titanium: Tomorrow's Metal Welded Today.** *Industry and Welding*, v. 30, July 1957, p. 59-61. (CMA)

A "top hat insert" by du Pont for a nitric acid condenser demonstrates the corrosion resistance of titanium. The insert has lasted six months with intermittent use and eight months in continual use in 60% nitric acid and shows no visible signs of corrosion. The welding of the insert was accomplished by an inert-gas shielded tungsten-arc process; care was taken to insure complete penetration. (K1d, R6g; Ti)

321-K. **Welding Stainless Steels.** Richard E. Paret. *Machinery*, v. 63, June 1957, p. 186-192.

Characteristics of austenitic, ferritic and martensitic steels; types of welding including oxy-acetylene, metal-arc, inert-gas, atomic hydrogen, submerged-arc, stud and resistance welding. (K1, K2, K3; SS)

322-K. **Adhesive Bonding of Light Metals.** A. E. Williams. *Metal Industry*, v. 90, May 31, 1957, p. 457-460.

Techniques, joint design, joint efficiency, sandwich construction and testing methods used in joining aluminum, magnesium or stainless steel. (K12; Al, Mg, SS)

323-K. **Heating Methods for Modern Brazing Operations.** *Metal Progress*, v. 72, July 1957, p. 65.

Collection of three papers given at the 10th Western Metal Congress and Exposition. Some observations about the brazing method (fits, assembly cleanliness and alloys) are followed by specific information about three methods of heating for mass production: in furnaces with protective atmospheres of vacuum, in molten salt baths, and rapid heating in air by high-frequency electric currents. Papers abstracted separately.
(K8j, K8k, K8n, 1-2)

324-K. **Furnace Brazing.** H. M. Webber. *Metal Progress*, v. 72, July 1957, p. 68-71.

Advantages of furnace brazing include versatility, economy of materials and time. Equipment and techniques. (K8j, 1-2)

325-K. **Salt Bath Brazing.** L. B. Rosseau. *Metal Progress*, v. 72, July 1957, p. 72-74.

Characteristics of dip brazing. Advantages in brazing of aluminum electronic components and aircraft honeycomb structure. (K8n)

326-K. **Induction Brazing.** W. E. Benninghoff. *Metal Progress*, v. 72, July 1957, p. 74-76.

Induction brazing is characterized by rapid, localized heating and offers excellent reproducibility of results. Typical applications. (K8k)

327-K. **Prevention of Martensite Formation During Arc Welding.** Fritz Dechner and Hermann Speich. *Metal Progress*, v. 72, July 1957, p. 194. (Digest from *Stahl und Eisen*, v. 76, Sept. 20, 1956, p. 1249-1251.)

Previously abstracted from original. See item 527-K, 1956.
(K1, N8, ST)

328-K. **How to Make Honeycomb Sandwich. Pt. 4. Brazed Assembly Is the Latest Method.** *Metalworking Production*, v. 101, June 7, 1957, p. 979-981.

Characteristics of honycomb structure; problems of welded and brazed assemblies; brazing methods. Furnace brazing is most practical technique to date, but induction brazing shows promise. (K8j, K8k, 7-9)

329-K. **800 Welded Wheels Per Hour.** *Modern Industrial Press*, v. 19, Apr. 1957, p. 21-23.

Fully automatic machine assembles and spot welds automobile wheels, pierces valve stem hole and embosses lug for hub cap.
(K3n, T21c, 17-7)

330-K. **How To Weld Molybdenum.** R. R. Freeman and J. Z. Briggs. *Steel*, v. 141, July 8, 1957, p. 101-102. (CMA)

Brittleness has been overcome as an obstacle to molybdenum welding by using arc-cast metal and protective atmospheres. If the weld will be subject to moderate forming, it may be wise to recrystallize and hot form. Electrolytic polishing of faying surfaces is recommended. Corner or edge welds are easier than butt welds. Spot and seam resistance welding have drawbacks. Percussion, flash and pressure welding in dry hydrogen produce good results. Top weld efficiency does not exceed 50% of the strength of the base. An insert gives recommendations for brazing molybdenum.
(K general; Mo)

331-K. **Welding of Titanium to Hafnium.** J. M. Gerken and S. A. Toftegaard. *U. S. Atomic Energy*

Commission, KAPL-M-JMG-6. Dec. 18, 1956. 7 p. (CMA)

Welds of good quality between titanium and hafnium may be produced by the tungsten-arc inert-gas process. These metals form a continuous series of solid solutions of a body-centered cubic structure. Best results are obtained with a single pass on each side and adjusting to get about 2/3 penetration into the titanium on each pass. The fusion zone was harder and stronger than the two individual metals. Weld contours and other data are presented. (K1d; Ti, Hf)

332-K. Ductility of Tungsten-Arc Welds in Molybdenum. N. E. Weare, R. E. Monroe and D. C. Martin. *Welding Journal*, v. 36, June 1957, p. 291s-300s. (CMA)

Tungsten-arc welds of molybdenum were made in the dry box to study effects of atmosphere purity, initial microstructure and cleaning methods. Only atmospheric purity was important. For welds in air the best welds resulted from the use of a standard shielding cup and a leading-trailing shield unit. About 3% tungsten in a molybdenum weld lowered ductility. Consistency runs of arc-cast molybdenum were made in and out of the dry box; bend ductility differed significantly.
(K9r, Q5g; Mo)

333-K. Effect of Nitrogen on the Soundness and Ductility of Welds in Molybdenum. W. N. Platte. *Welding Journal*, v. 36, June 1957, p. 301s-306s. (CMA)

Molybdenum weld metal absorbs nitrogen rapidly from argon atmospheres containing over 1%, to the detriment of the low-temperature ductility. Nitrogen is not implicated in weld porosity or hot cracking. The temperature for completely brittle fracture is raised by adding nitrogen up to 0.07%. Lesser concentrations allow the stress for brittle fracture to increase as the temperature of failure decreases, because the boundary film of nitrides tends to become discontinuous. Nitrogen in the argon should be reduced to the level of that in the metal for maximum weld ductility.
(K1d, Q23p; Mo, 1-7)

334-K. Effects of Interstitial Elements on Weldability of Ti-7% Al-3% Mo and Ti-6% Al-4% V. J. F. Rudy, J. B. McAndrew and H. Schwartzbart. *Welding Journal*, v. 36, July 1957, p. 313s-320s. (CMA)

The effect of adding interstitials on the weldability of Ti-7Al-3Mo and Ti-6Al-4V was studied in the as-welded and post-welded heat treated conditions for 1/16-in. sheet. The evaluation of tension tests and free-bend transverse-weld tests shows that Ti-6Al-4V is much more weldable than Ti-7Al-3Mo. Heats of the latter containing 0.1% total interstitials were only marginally weldable. Ti-6Al-4V tolerates up to 0.21% O, but more than 0.1% N embrittles and as little as 0.07% C may add to nitrogen embrittlement. Postweld heat treatments did not give much improvement in ductility.
(K9s, 2-10; Ti)

335-K. Arc Welding of Vacuum and Inert-Atmosphere-Melted Zircaloy-2. H. C. Ludwig. *Welding Journal*, v. 36, July 1957, p. 335s-351s. (CMA)

Zirconium sponge-base alloys show different weld penetrations, according to whether they were vacuum-melted or inert gas-melted. The anode heat output is higher for the latter, and is believed to depend on the diffusion and evaporation of an impurity (e.g. chlorine) which forms negative ions and increases the anode voltage. Control of the chlorine content in arc melting is suggested. (K1, C5h, 1-23; Zr)

336-K. (French.) **Welding in the Construction of the New Road Bridge Across the Save, Belgrade.** M. Radojkovic and P. Widman. *Soudage et Techniques Connexes*, v. 11, May-June 1957, p. 133-145.

Description of the new bridge and of the method used for its construction; plate girders with a 261-m. span, orthotropus slabs; welding of all slab joints in the shop as well as on the site; submerged-arc welding and welding with electrodes laid on the joint; inspection of the material on the basis of Schnadt's conceptions, a summary of which is given. I.I.W. tests and Kommerell tests. X-ray and iridium-192 testing of welds. (K1, K9r, T26p; ST)

337-K. (French.) **A Visit to the Braud Works.** *Soudage et Techniques Connexes*, v. 11, May-June 1957, p. 156-158.

Details of the fabrication of harvester-thresher machines. Equipment and welding processes used at the Braud plant, Saint-Mars-la-Jaille, near Nautes. (K general, 1-2; T3r)

338-K. (French.) **Analysis of the Papers Presented at the Public Session of the Annual Meeting of the International Institute of Welding, Madrid, 1956.** H. Gerbeaux. *Soudage et Techniques Connexes*, v. 11, May-June 1957, p. 159-187.

Summary and comments on 25 papers presented on the theme "Productivity by Welding." The main section deals with specific questions and special welding, cutting and brazing processes, welder qualification, work planning, welding in different industries of various countries, and finally productivity by welding. 28 ref. (K general, A12h)

339-K. (German.) **Application of Welding Processes to Cast Iron.** C. Hase. *Giesserei*, v. 44, June 1957, p. 370-373.

Working methods and range of application of the oxy-acetylene and electric arc welding processes; calculation of the economic efficiency of cold and hot welding; thermal cutting processes; application of the welded joint as a design element.
(K1, K2, G22; CI)

340-K. (German.) **Welding of Cast Iron.** Hermann Beyer. *Giesserei*, v. 44, June 1957, p. 374-382.

Characteristics of the material; weldable and nonweldable cast iron; stress conditions; welding rods; welding methods for cast iron; hot welding; semihot welding, cold welding; structure and strength of the cast iron materials; hot vs. cold welding; economic efficiency of cast iron welding. 4 ref. (K general; CI)

341-K. (German.) **Application of Modern Welding Processes to Steel and Malleable Iron Castings.** Hans Zeuner and Kurt Zimmerman. *Giesserei*, v. 44, June 1957, p. 382-388.

Welding methods; welding electrodes; effect of alloying elements on the weldability; welded cast iron structures. 4 ref.
(K general, K9s, 2-10; ST, CI-s)

342-K. (German.) **Development of a New Testing Method to Determine Hot Cracking Tendency of Primary Beads of Ordinary and Austenitic Electrodes.** Henri M. Schnadt. *Oerlikon Schweissmitteilungen*, v. 15, no. 27, 1957, p. 31-42.

A new method with the following advantages: easy and speedy performance, testing severity ranging within large limits, consistency of measuring results, clear and numerical definition of results, small consumption of base metal. Method suits any electrode gage and any metal thickness. It can be applied for research and manufacture control. (K9r, 9-22)

343-K. (German.) **Emulsion Prevents the Burning-In of Spattering in Welding Operations.** *Werkstatt und Betrieb*, v. 90, June 1957, p. 349-350.

Silicone emulsion serves to protect the surfaces of parts to be welded against the burning-in of weld spatterings. Loose spatterings can be easily wiped from the surface.
(K9p, L26p)

344-K. (German.) **Special Designs of Seam Welding Machines.** Otto Gengenbach. *Werkstatt und Betrieb*, v. 90, June 1957, p. 351-355.

Seam welders are standard machines with special attachments and conveyer systems for special tasks; special apparatus with movable welding rollers but stationary stock; apparatus with fixed welding rollers under or between which the material is placed. (K3p, 1-2)

345-K. (German.) **Welding of High-Temperature Alloys.** Rolf Krause. *Werkstatt und Betrieb*, v. 90, June 1957, p. 357-360.

Reference values for autogenous, resistance and arc welding, with and without inert gas. Data for treatment of high-temperature nickel and cobalt alloys.
(K1, K2, K3; Ni, Co, SGA-h)

346-K. Solders, Fluxes. Pt. 2. How to Use. Frank J. Versagi. *Air Conditioning and Refrigeration News*, v. 81, June 10, 1957, p. 40-41.

Factors to consider in selecting a solder. (K7; SGA-f)

347-K. Metallurgy of Welding Aluminum and Its Alloys. W. I. Pumphrey and E. G. West. *British Welding Journal*, v. 4, July 1957, p. 297-306.

Effect of temperature, oxygen, hydrogen and other elements in the parent metal and the weld; post-welding treatment. 10 ref.
(K9n, K9q; Al)

348-K. Metallurgical Background to Magnesium Alloy Welding. E. F. Emley. *British Welding Journal*, v. 4, July 1957, p. 307-321.

Properties relevant to welding behavior. Brief review of welding methods suitable for magnesium; flux entrapment problem encountered in gas welding; difficulties in gas welding alloys containing zirconium. 42 ref. (K2; Mg, Zr)

349-K. Consideration of the Factors Affecting Porosity in Self-Adjusting Metal-Arc Welds on Mild Steel. A. R. Muir. *British Welding Journal*, v. 4, July 1957, p. 323-335.

Discussion of two factors causing excessive porosity: quantity of deoxidant present in the weld and efficiency of the gas shield. 8 ref.
(K1d; CN, 9-18)

350-K. High-Speed Production of Welded Aluminum Tubing. I. E. Suchoversky and A. S. Coghill. *Canadian Metalworking*, v. 20, June 1957, p. 28-33.

Aluminum irrigation tubing and

industrial piping; high-frequency resistance welding permits versatile range of tubing. (K3, T3q, T26r; Al)

351-K. Adhesives Aim at Metalworking. *Iron Age,* v. 180, July 11, 1957, p. 63.

A number of major firms are exploring and developing adhesives for metal bonding. (K12)

352-K. A Theory of Adhesive Scarf Joints. J. L. Lubkin. *Journal of Applied Mechanics,* v. 24, June 1957, p. 255-260.

Analyzes adhesive stress distribution in bonded metal and establishes conditions under which narrow or wide adhesive scarf joints can have uniformly distributed adhesive stresses. 12 ref. (K12)

353-K. Operations on Body Components for Ford Consul, Zephyr and Zodiac Cars. *Machinery,* v. 90, June 7, 1957, p. 1274-1281.

Methods and machines used in assembly and spot welding of front fenders. (K3n, T21a; ST)

354-K. Operations on Body Components for Ford Consul, Zephyr and Zodiac Cars. *Machinery,* v. 90, June 14, 1957, p. 1316-1327.

Operations and equipment used in multiple-spot welding of steel floors and chassis to form automobile underbodies. (K3n, T21a; ST)

355-K. 400 Volkswagen Transports a Day. David Scott. *Metalworking Production,* v. 101, May 31, 1957, p. 923-932.

Arc and spot welding jigging and handling procedures in assembly of Microbus and truck frames and bodies. (K1, K3n, T21a, 1-2)

356-K. How to Make Honeycomb Sandwich. Pt. 3. Sandwich Assembled With Adhesives. E. J. Tangerman. *Metalworking Production,* v. 101, May 31, 1957, p. 937-941.

Lists commonly used adhesives and illustrates cleaning and curing methods used in adhesive bonding of honeycomb assemblies. (K12, 7-9)

357-K. Multi-Head Welding Equipment for Motor Bodies. J. A. Wright. *Metropolitan-Vickers Gazette,* v. 28, Apr. 1957, p. 97-101.

The portable spot welder compared with the multi-head machine. Multi-head machine currently in use in the production of subassemblies for Ford car bodies at Briggs Motor Bodies, Dagenham, England. (K3n, 1-2)

358-K. Brazing, Adhesive Bonding, Resistance Welding. Three Joining Methods for High-Temperature. *SAE Journal,* v. 65, May 1957, p. 62-64.

Methods commonly used for attaching the airplane skin to the honeycomb core. (K8, K12, K3; SGA-h, 7-9)

359-K. How to Avoid Trouble With Stainless Welds. Pt. 1. George E. Linnert. *Steel,* v. 140, June 24, 1957, p. 116-119.

Cracks and failures usually due to notch effects, stress corrosion factors and surface contamination with materials such as carbon, sulphur or zinc. (K general, R1d, 9-22; SS)

360-K. How to Avoid Trouble With Stainless Welds. Pt. 2. George E. Linnert. *Steel,* v. 141, July 1, 1957, p. 70-72.

Effects of contamination by zinc and sulphur. (K general; SS)

361-K. How to Braze Titanium. *Steel,* v. 141, July 22, 1957, p. 103-106. (CMA)

Most common brazing procedures are satisfactory on a laboratory scale, provided the surface is prepared properly and the atmosphere is controlled. Water vapor must be removed from the helium or argon used. Silver or silver-base alloys are the preferred brazing alloys; copper, aluminum, and sometimes nickel, give good results also. Titanium-base brazes cause undercutting of the metal. Resistance, torch and induction brazing are discussed. (K8; Ti)

362-K. Bonding Ceramic Tool Tips to Steel Shanks. H. J. Siekmann. *Tool Engineer,* v. 39, July 1957, p. 101-104.

Cutting tests with adhesive bonded ceramic tips indicate strength of epoxy cemented joints; bonding methods used. (K11b; SGA-j)

363-K. Study of Effects of Alloying Elements on the Weldability of Titanium Sheet. J. F. Rudy, J. B. McAndrews and H. Schwartzbart. Wright Air Development Center, Technical Report 53-230, Pt. 3. *U. S. Office of Technical Services,* PB 131049, Mar. 1957, 151 p. (CMA)

Ti-6Al-4V was studied to determine the weldability effects of interstitial contamination, to complete a study encompassing the alloys Ti-5Al, Ti-7Al-3Mo and Ti-25V. Fifteen titanium alloys were tested mechanically as fabricated, as welded and post-weld heat treated to determine weldability. The major loading stresses in tensile and free bend tests were transverse to the welding direction. (K9s, 2-10; Ti, 4-3)

364-K. Attaching Thermocouples by Capacitance Welding. Naval Gun Factory. *U. S. Office of Technical Services,* PB 121901, Apr. 1955, 8 p. 50c.

Through a capacitance welding technique thermocouple wires are welded individually to the workpiece through discharge of a bank of charged capacitors. Weld characteristics are controlled by means of a potentiometer. The welder is portable and operates from standard power supply. (K1, 1-2, X9q)

365-K. Development of Argon-Arc Welding in the Aircraft Industry. F. W. Copleston. *Welding and Metal Fabrication,* v. 25, May 1957, p. 178-182.

Application of tungsten, argon-shielded arc welding in aircraft industry listing material and components welded, types of hand welded torches and automatic welding equipment. (K1d, 1-2)

366-K. Welding Nuclear Power Station Units. *Welding and Metal Fabrication,* v. 25, June 1957, p. 196-203.

Problems involved, welding techniques and testing. (To be concluded.) (K general, W11p)

367-K. Spot Welding Applications in the Continental Railway Industry. C. A. Burton. *Welding and Metal Fabrication,* v. 25, June 1957, p. 204-211.

Examples of resistance welding applications being carried out by European rolling stock manufacturers. (K3n, T23)

368-K. High Vacuum Furnace Brazing. *Welding and Metal Fabrication,* v. 25, June 1957, p. 212-214.

New method of brazing stainless steel and high-nickel alloys which involves the use of a high-vacuum resistance-heated furnace eliminates need for a flux. (K8j, 1-23; SS, Ni)

369-K. Design for Welding. T. B. Jefferson. *Welding Engineer,* v. 42, Mid-June 1957, p. 7-20.

Proper weld design for satisfactory service and ease in manufacture. Data sheets on grooves for arc and gas-welded joints, weld metal requirements, types of welded joints, computing weld stresses, welding symbols, estimating weight of electrode metal and cost estimation. (K general, 17-1)

370-K. Welding Articles of 1956-1957. *Welding Engineer,* Mid-June 1957 p. 24-27.

Brief abstracts of 96 articles appearing in *Welding Engineer* from June 1956 to July 1957; topics include arc welding, brazing, soldering, construction, design, gas welding, inspection, resistance welding and statistics. (K general, 11-15)

371-K. Engineering Reference Data Sheets. *Welding Engineer,* v. 42, Mid-June 1957, p. 28-36.

Trade name of commonly used iron and iron powder electrodes, trade name and composition of silver brazing alloys, data on selecting proper gas welding process, welding and cutting tip numbers and sizes, difficulties in metal arc welding, melting points and color scale for common metals and alloys and the properties of acetylene, propane and oxygen. (K general, S22)

372-K. Time-Temperature Effect on Properties of Weld Heat Affected Zone in Type-347 Stainless Steel. E. F. Nippes, B. Schaaf, W. L. Fleischmann and R. L. Mehan. *Welding Journal,* v. 36, June 1957, p. 265s-270s.

Samples were heated in synthetic welding cycles to a peak temperature of 2450° F. to establish time-temperature behavior of high-temperature metallurgical structure established in welding cycle. Mechanical properties were not impaired by high-temperature heat treatment. Corrosion resistance in nitric acid is time-temperature dependent. 7 ref. (K9n, 2-11, 3-17; SS)

373-K. Relative Behavior of Notch-Toughness Tests for Welded Steel. W. J. Murphy, W. D. McMullen and R. D. Stout. *Welding Journal,* v. 36, June 1957, p. 307s-311s.

Clarification and correlation of notched slow-bend (Kinzel), Naval Research Laboratory (NRL) drop-weight and V-notch Charpy tests. 6 ref. (K9r, Q23s; ST)

374-K. Welding of Magnesium Alloys. Paul Klain. *Welding Journal,* v. 36, July 1957, p. 321s-329s.

Weldability, metallurgy and properties of magnesium alloys currently produced in the United States: various welding methods. 5 ref. (K general; Mg)

375-K. Practical Welding Metallurgy of Nickel and High-Nickel Alloys. George R. Pease. *Welding Journal,* v. 36, July 1957, p. 330s-334s.

Effect of 20 elements on weldability which may be present in nickel alloys. Cracking seldom if ever can be traced to presence of dissolved gases. 8 ref. (K9s, 2-10; Ni)

376-K. Self-Fluxing Airproof Brazing Alloys. Nikolajs Bredzs and Harry Schwartzbart. *Welding Journal,* v. 36, July 1957, p. 348s-352s.

Theoretical considerations governing formulation of above alloys. Combination of lithium-boron would appear almost ideal. A Cu-Ni-Li-B alloy used to braze steels in air, although not commercially feasible, demonstrates principles outlined. 4 ref. (K8; SGA-f)

377-K. Recent Developments in Magnetic-Force Welding. E. J. Funk. *Welding Journal,* v. 36, June 1957, p. 576-582.

Characteristics of machines of present design, methods of controlling electrode-force application, new type of welding process. (K3, 1-2)

378-K. Design, Fabrication and Erection Practices for Efficient Welded Highway Bridges. Omer Blodgett. *Welding Journal,* v. 36, June 1957, p. 583-592.

Summary of practices over past ten years by which various states have achieved savings in material and time by substituting welded bridges for riveted constructions. (K general, T26p, 17-1; ST)

379-K. Gas-Shielded Metal-Arc Welding of High-Pressure Valves. Fred R. Zacheus. *Welding Journal,* v. 36, June 1957, p. 593-596.

Inert-gas welding process shows improvement in uniformity and quality of welds, reduction in unit cost and better operator safety. (K1d, T7b)

380-K. Evolution of High-Tensile Weld Metal With Low-Hydrogen Electrodes. D. C. Smith. *Welding Journal,* v. 36, July 1957, p. 677-692.

Some of the causes underlying the unsatisfactory performance of conventional-type coatings and evolution of higher strength weld metals which have kept pace with the steels. 7 ref. (K1a; ST)

381-K. High-Frequency Resistance Welding. Wallace C. Rudd. *Welding Journal,* v. 36, July 1957, p. 703-707.

High-frequency resistance heating for strip and tube welding. (K3; 4-3, 4-10)

382-K. Multipass Welding of Steel Pipe With CO_2. E. A. Quinlan, Don Alrick and A. P. Demmer. *Welding Journal,* v. 36, July 1957, p. 710.

Of four welding processes, gas-shielded metal-arc process with automatic welding head, using CO_2, was best for 40-ft. pipes welded in 200-ft. sections. (K1d; ST, 4-10)

383-K. Vacuum Brazing Economical Method for Large, Continuously Bonded Multi-Metal Assemblies. R. C. Bertossa. *Western Metals,* v. 15, July 1957, p. 58-60.

Advantages, applications, potential uses. (K8, 1-23)

384-K. Properties of Welds Made Under Argon and Carbon Dioxide. E. M. Eskin, E. P. Pogozhkin and N. M. Novoshilov. *Svarochnoe Proizvodstvo,* no. 1, Jan. 1957, p. 15-17. (*Henry Brutcher Translation* no. 3947).

Comparative study of properties of welds made with consumable electrodes with alternating current, using a high-frequency generator, in an atmosphere of argon as against one of carbon dioxide. Steel compositions used; particulars on welding variables;. mechanical properties (tensile, bend, impact, creep and fatigue tests) of welds obtained in argon versus carbon dioxide. Various qualitative characteristics (arc stability, weld shape, penetration, etc.) of welds in high and low-alloy steels. (K9n, K1d, AY, SS)

385-K. (German and French.) **Temperatures During Brazing.** G. M. Blanc. *Zeitschrift für Schweisstechnik,* v. 47, June 1957, p. 148-150.

Definition of French, English and German terminology currently employed in brazing; working temperatures and wetting temperatures and related terms. (K8)

386-K. (German and French.) **Welding of Cast Iron.** Curt C. Elster. *Zeitschrift für Schweisstechnik,* v. 47, June 1957, p. 150-154.

The welding process and its application to repairs in industry. (Concluded.) (K general, 18-22; CI)

387-K. (German.) **Bonding of Light Metals.** J. Bernert. *Fertigungstechnik,* v. 7, Jan. 1957, p. 43-45.

Effect of hardness of thermosetting adhesives on strength and corrosion characteristics. 8 ref. (K12; EG-a39)

388-K. (German.) **Application of Welding in the Repair of Machinery.** K. Weber. *Schweissen und Schneiden,* v. 9, June 1957, p. 280-283.

For the welding of cast iron a suitable preheating procedure eliminates distortion and cracking. Cast iron filler rods for depositing high-manganese weld metal have been developed with coatings which produce protective slag deposits. Low-temperature welding is also used, and if the weld is properly designed and suitably reinforced satisfactory working conditions can be obtained. With suitable pre and post-heating procedures, high-tensile steel castings can also be safely repaired by welding. (K9p, K9q, 18-22; CI, ST)

389-K. (German.) **Special Welding Methods in the Manufacture of Alloy Sheet Steel Structures.** W. Liebig. *Schweissen und Schneiden,* v. 9, June 1957, p. 297-298.

The hollow steel blades used in impellers for wind tunnels differ from aeroplane wings in that the blades show a twist. The important consideration in welded design is the stiffness of the blades. (K general, T26, 17-1; ST, 7-1)

390-K. (German.) **Importance of Welding in the Working of Copper and Copper Alloys.** Reiner Köcher. *Schweissen und Schneiden,* v. 9, June 1957, p. 299-301.

The autogenous fusion process is at present mostly used. The argon-arc process is used for welding thin sheets and has also shown promise in welding copper-plated boiler plate. The inert-gas-shielded welding of copper (sigma process) produces welded seams of high purity and good mechanical properties. Procedures for welding brass, tin bronze, silicon bronze, aluminum bronze and copper-nickel alloys. (K1; Cu)

391-K. (German.) **Multi-Spot Welding in Large Welding Machines as a Means of Mass Production.** Anton Weis. *Schweissen und Schneiden,* v. 9, June 1957, p. 304-307.

A semi-automatic multi-spot welding device reduced operating times by 87%. It is doubtful whether the use of press-type welding machines together with the application of interchangeable multi-spot welding tools is always advantageous. They make it possible, however, to build up a type of transfer line in which similar components can be completely welded, and which can be easily switched from the manufacture of one component to another. (K3n, 1-2)

392-K. (German.) **The Use of Gas Welding in the Manufacture of Railroad Track Crossovers.** K. Hilgers and A. Heim. *Schweissen und Schneiden,* v. 9, June 1957, p. 318-321.

Crossovers are most critical parts of a railway track. The oxy-acetylene welded crossover is usually far superior to the bolted one, both technically and economically. Metallurgically, good results are obtained by employing the oxy-acetylene welding process. (K2h, T23q; ST)

392-K. (German.) **Developments of "Thermit" Welding.** W. Ahlert. *Schweissen und Schneiden,* v. 9, June 1957, p. 321-324.

Welding of rails by "thermit welding" is possible in much shorter times than was possible with older processes. The reduction in preheating time and the application of prefabricated molds make economic operations of 10 to 12 min. duration possible. The alumino-thermic building up of rails is used for the repair of damaged rail surfaces. Rails repaired by this process can be used as if they were completely new. (K4, T23q)

394-K. (Italian.) **Equilibrium in the Slag-Metal Reaction in Arc Welding. Pt. 3. Equilibrium of the Silicon Reaction.** Agostino Bargone, Vittorio Gottardi and Piero Jadanza. *Rivista Italiana della Saldatura,* v. 9, Jan-Feb. 1957, p. 9-16.

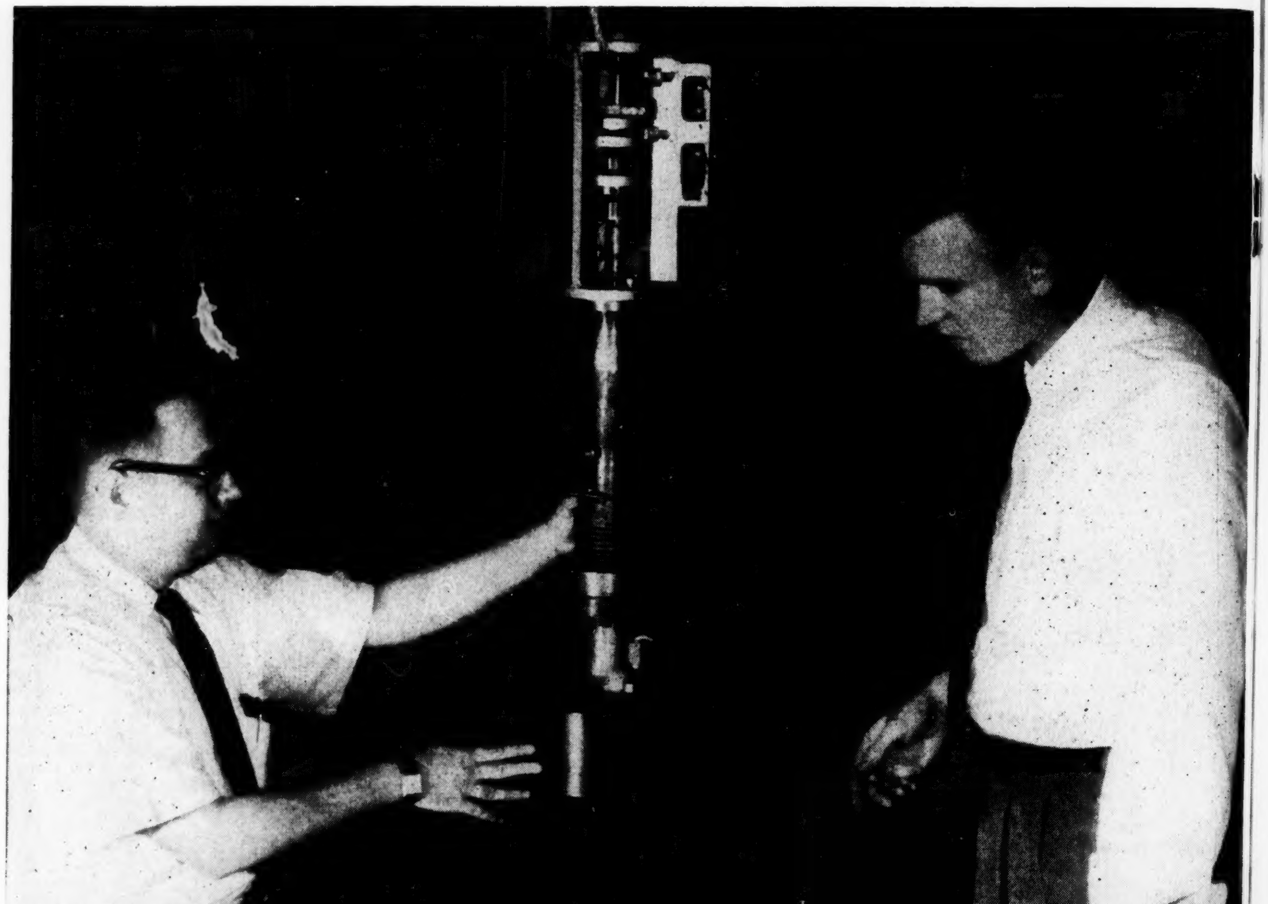
Slag-metal system tends to attain thermo-dynamic equilibrium, but all conditions necessary for this are not usually present. However, if such conditions are artificially created, it is possible, in certain cases, to obtain concentrations corresponding to those thermodynamically calculated for equilibrium conditions. 11 ref. (K9n, K1; RM-q)

395-K. (Russian.) **Study of Titanium Welding.** M.Kh. Shorshorov, G. V. Nazarov, T. A. Amfitestrova and A. A. Baykov. *Svarochnoye Proizvodstvo,* no. 4, Apr. 1957, p. 1-5.

Study of the weldability of technically clean titanium of different grades carried out in the laboratory. The greatest difficulties are connected with the deterioration of the properties of the basic metal in the zone near the joint. It is necessary to select a technology and system of welding based on conditions whereby the time will be reduced, during which the metal is at the temperature where the intensive beta-phase grain growth takes place so that the rate of cooling during the transition from the beta to alpha phase will be reduced. (K9s; Ti)

396-K. (Spanish.) **18-4-1 Co High Speed Steels. Metallurgical Problems in Flash Welding to a Carbon Steel.** F. A. Calvo. *Ciencia y Técnica de la Soldadura,* v. 7, Mar-Apr. 1957, 12 p.

High-speed steel overlays on carbon steel tool bases. Any defects in high-speed steel accentuate problems of flash welding; deep decarburization and formation of eutectic in high-speed steel result from prolonged low-strength arc discharge; partial or total breakdown of eutectic areas causes formation of graphite; presence of grains of high-speed steel dissolved in carbon steel promotes formation of eutectic in lamellar form, and hence of brittleness. Most of above phenomena can be avoided, or their harmful effects reduced, by controlling current strength, duration of arc discharge, joining pressure, cooling speed. 3 ref. (K3r, L24; CN, TS-n)



Dr. Eric Rau and James Alger, Bettis engineers cooperating on different aspects of this program, are discussing details of a preliminary corrosion fatigue test. Note two specimens mounted on a knife edge in the machine. The entire assembly is attached to the head of an autoclave for immersion in water at 600° Fahrenheit. Dr. Rau received his Ph.D. in physical chemistry from New York University in 1955. Mr. Alger obtained his Master's degree in metallurgy from the University of Washington in 1955.

MATERIALS ENGINEERING

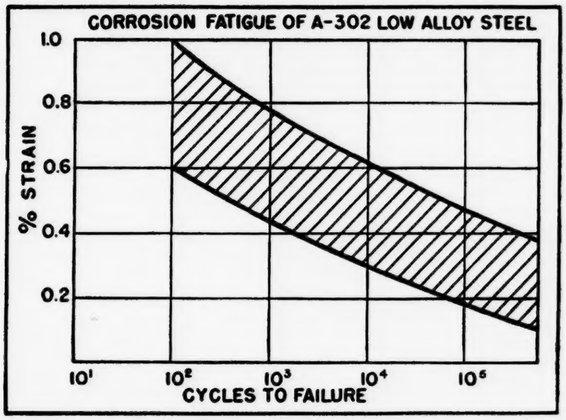
Evaluation of Low Alloy Steels for Nuclear Power Plants

One important phase of metallurgical research and development conducted at Bettis Atomic Power Division concerns the application of more economical non-core materials to the stringent requirements of nuclear reactor plant components.

To reduce the cost of nuclear power, Bettis Plant metallurgists are trying to find substitutes for the special stainless steels and expensive fabrication methods now employed. In connection with this program, they are investigating the behavior of the carbon and low alloy steels for use in the primary coolant of a nuclear reactor.

To eliminate the expensive stainless steel cladding in pressure vessels, Materials Engineering at Bettis Plant is investigating the suitability of a high strength manganese-molybdenum steel (ASTM A-302, Grade B) for reactor vessel construction. However, the reactor vessel, which contains the nuclear core, experiences many thermal transients causing very high cyclic strains in the vessel walls. In addition, carbon steels have relatively high corrosion rates in water at 600° F under a pressure of 2000 psi. To determine if the corrosion of the carbon steel reduces its fatigue strength, extensive experimental work is being carried out.

In one such study, Dr. Eric Rau, senior engineer, has been testing the corrosion fatigue resistance of ASTM A-302 to high strains in corroding water environment. Fatigue specimens, placed in specifically designed equipment, are subjected to very high plastic strains, up to 1% strain per cycle. Five specimens of varying thicknesses are tested simultaneously. Thus five points on a strain versus cycle-to-failure diagram are obtained in each run. Also the time per cycle can be adjusted to observe the frequency effect on high strain fatigue. Dr. Rau plans to conduct these tests at a frequency as low as one cycle per minute.



The cross-hatching in the graph indicates the strain range to be investigated. Fatigue specimens will be strain cycled in primary coolant water at 600° F. In each experiment five points on the strain vs cycles-to-failure curve will be obtained.

From the results shown by the strain versus cycle-to-failure diagrams, reactor designers can better determine the applicability of these materials to new designs.

This is only one example of the challenging work awaiting you here. We welcome confidential inquiries from metallurgists interested in the excellent careers offered by the new and growing nuclear power industry. Please address your résumé to: Mr. M. J. Downey, Bettis Atomic Power Division, Westinghouse Electric Corporation, P. O. Box 1468, Dept. A-187, Pittsburgh 30, Pennsylvania.

BETTIS ATOMIC POWER DIVISION

Westinghouse

Cleaning, Coating and Finishing

385-L. How to Fire Aluminum Enamels. Paul A. Huppert. *Ceramic Industry,* v. 70, June 1957, p. 98-99.

Furnace types; firing cycles; time and temperature ratios for any given enamel composition; finish characteristics. (L27; Al)

386-L. Control of Corrosion With Zinc Coatings. J. L. Kimberley. *Corrosion,* v. 13, June 1957, p. 385t-391t.

Briefly outlines history of uses of metallic zinc coatings to control corrosion on steel; theory of zinc protective action, hot dip, metallizing, electrodeposition, sheradizing and painting methods of application; case histories cited to show merits and weaknesses of zinc coats. (L16, L17; Zn)

387-L. Basic Data on Mechanical Cleaning Operations in Steel Plants. Gilbert D. Dill. *Iron and Steel Engineer,* v. 34, May 1957, p. 123-131.

Brief descriptions of installations of centrifugal shot blast cleaning units for cleaning and descaling slabs and billets for inspection, used alone or in connection with acid pickling on carbon steel, high-silicon, stainless and other alloy steel strip, sheet plate and bar stock, extruded shapes, wire rod and structural steels; shot etching of mill rolls for special finishes; ingot mold conditioning. (L10c, 1-2; CN, AY, SS, 4-3, 4-5, 4-7, 5-9)

388-L. Peen Plating. G. H. Jenner and T. P. Hoar. *Metal Industry,* v. 90, Apr. 26, 1957, p. 329-331.

Abstract of paper presented at Institute of Metal Finishing, Brighton, England. Describes plating method performed in modified tumbling barrel using metal powders for coating. Metal powders include zinc, brass, cadmium, tin, lead and aluminum. (L29; Zn, Cu-n, Cd, Sn, Pb, Al, 6-18)

389-L. Bright Tin Coatings. Electrodeposition of Tin as a Bright Coating. A. M. Harper, A. Mohan and S. C. Britton. *Metal Industry,* v. 90, May 17, 1957, p. 421-423.

Bright ductile deposits of tin obtained from acid stannous sulphate to which a dispersion of wood tar in octyl sulphuric acid solution has been added. Effects of varying temperature, current density, tar content, salt content in electrolyte, sulphuric acid content on brightness, ductility and other properties of deposits. (L16, *Sn*)

390-L. Plating Plant Layout. P. Berger. *Metal Industry,* v. 90, May 31, 1957, p. 463-467.

Proposed plant layout for plating of copper, cadmium, nickel, chromium, zinc or tin on components made from steel, brass or zinc-base alloys. (L17, 18-17; ST, Cu-n, Zn; *Cu, Cd, Ni, Cr, Zn, Sn*)

391-L. Adherence of Porcelain Enamel Ground Coats. R. M. King. *Metal Products Manufacturing,* v. 14, June 1957, p. 58-59, 62.

Observations on the formation of metal dendrites at ground coat-steel interfaces. 7 ref. (L27, N12b)

392-L. Electroplating of Zinc Die Castings. Pt. 3. Ernest Horvick. *Metal Products Manufacturing,* v. 14, June 1957, p. 64-65, 90.

Operating details involved in the electroplating of rolled and die cast zinc in various basic designs and complex shapes. (L17; Zn, 5-11)

393-L. Ball Burnishing in a Barrel. *Precision Metal Molding,* v. 15, June 1957, p. 51-53.

Barrel finishing method for polishing aluminum or zinc die castings uses medium-size barrel with power-driven fixture rack and steel balls or cones as media. (L10d, W20, 1-2)

394-L. Extrusion Cladding of Zirconium to Uranium. R. J. Beaver. *U. S. Atomic Energy Commission,* CF-51-12-48. Dec. 4, 1951. 8 p. (CMA)

Preliminary work on the extrusion cladding of zirconium to uranium is reported. Five billets have been extruded, using dry-box welding or induction-brazing with nickel for sealing. The extrusion temperature was 620° C. Die design and dummy blocks used are described. The most serious problem is re-entrants around the uranium core of the finished bar. Treatment of each billet is outlined. (L22, F24; Zr, U)

395-L. (French.) **Influence of Pretreatment and Degree of Surface Oxidation Before Painting on Paint Life.** Kurt F. Tragardh. *Corrosion et Anticorrosion,* v. 5, June 1957, p. 169-173.

Long-term Swedish studies have shown that the degree of surface rust on steel prior to painting and pretreatment have a direct bearing on paint life. Paint survival is considerably prolonged if pretreatment and painting are effected before steel surfaces begin to rust. (L26n)

396-L. (French.) **Protection of Metals by Butyral Polyvinyl Complexes, Phosphoric Acid and Chrome Derivatives.** P. Duval. *Corrosion et Anticorrosion,* v. 5, June 1957, p. 189-193.

Characteristics and constituents of wash primers; advantages; anticorrosive behavior; applications; extent of protection possible. (L26p, L14)

397-L. (French.) **Wetting Agents.** *Galvano,* no. 245, June 1957, p. 22-27.

Principal categories of wetting agents and their properties; use of soaps; alkyl-aryl sulphonates; cationic composition; petrol derivatives; use of cleaning solutions; wetting properties. (L12)

398-L. (French.) **Automation in Electroplating and Conveyor Systems. Pt. 2.** K. Gebauer. *Galvano,* no. 245, June 1957, p. 31-38.

Automatic equipment and controls necessary for plating procedures; construction, operation and applications of machines in electroplating process. (L17, 1-2, 18-24)

399-L. (French.) **Hot Tinning.** A. Herz. *Galvano,* no. 245, June 1957, p. 47-48.

Preparation of the metal surface; scouring and degreasing; acid solutions; fluxing; operating procedures. (L16, 1-16; *Sn*)

400-L. (French.) **Treatment of Used Pickling Baths of Ferrous Products.** J. Labergere. *Metallurgie et la Construction Mecanique,* v. 89, June 1957, p. 567-571.

Review of essential chemical equations; explanation of phenomena observed in practice. Treatment of baths by sulphating (scope of this pickling process). Advantages of sulphuric pickling as compared with hydrochloride pickling. (L12g; ST)

401-L. (French.) **Technical Comments on Some Treatments of Mechanical Parts by Hard Chrome Plating.** P. Morisset. *Métaux-Corrosion-Industries,* v. 32, May 1957, p. 208-213.

Advantages of chromium plating and its numerous applications with reference to electrolytically polished surface, piston rings, aluminum and aluminum alloys, compressor motor cylinders, brake drums and disks, textile machine parts, hydraulic turbines and musical instruments. 5 ref. (L17; *Cr,* 17-7)

402-L. (French.) **Theoretical Study of Decomposable Varnish for Protection of Combustion Chamber Walls.** H. Gelly. *Métaux-Corrosion-Industries,* v. 32, May 1957, p. 214-223.

Use of heat resistant films in rocket motors; principles underlying their action; determination of the thickness of insulating coating necessary for protection. 13 ref. (L26n; SGA-h)

403-L. (French.) **Surface Appearance of Anodized Aluminum.** Francois Flusin. *Revue de L'Aluminium,* no. 243, May 1957, p. 525-530.

Defects (pitting, stains, etc.) that have appeared in anodized aluminum and aluminum alloy sheets. Correlation between the exact conditions of the anodic treatments carried out and the defective behavior of the anodic coatings. (L19; Al, 9-21)

404-L. (German.) **Galvanizing Screws and Other Small Parts. Pt. III.** Werner Peters. *Draht,* v. 8, Mar. 1957, p. 82-83.

Calculation of layer thickness; current intensity; exposure time; electrolytic efficiency; distribution of deposit; losses; tables. (L16; T7f; ST, *Zn*)

405-L. (German.) **Application of Ion Exchange in Electroplating.** Ferdinand Furrer. *Metallwaren-Industries und Galvanotechnik,* v. 48, Feb. 1957, p. 72-81.

The application of ion exchange resins to chromic acid contaminated wastes; nickel plating; acid copper plating; recovery of zinc; cyanide containing wastes; treatment of pickling acids; and rinses. (L17, A11d)

406-L. (German.) **Fundamental Calculations in Electroplating Practice. Pt. II.** Walter Nohse. *Metallwaren-Industrie und Galvanotechnik,* v. 48, Mar. 1957, p. 98-109.

Influence of operating techniques on preparation time for articles to be electroplated; electroplating equipment; standards for personnel performance and equipment utilization. 3 ref. (L17, 1-2)

407-L. (German.) **Filtration in Electroplating. Pt. IV.** Erich Stöcker. *Metallwaren-Industrie und Galvanotechnik,* v. 48, Mar. 1957, p. 109-116.

Various commercial filter installations available to the industry. (L17, 1-2)

408-L. (German.) **Current Status of Nickel Plating.** H. C. Castell. *Metallwaren-Industrie und Galvanotechnik,* v. 48, Mar. 1957, p. 119-125.

Factors influencing mechanical properties; brightening baths, nickel sulphamate baths, zinc-nickel alloy baths; electroless nickel plating and its future. (L17, L28; Ni)

409-L. (German.) **Structure and Suitability for Pickling of Hot Rolled Strip.** *Stahl und Eisen,* v. 77, June 27, 1957, p. 845-853.

Testing method; metallographic examination of strip of different origin; pickling tests showing continuous record of the weight loss, potential and intensity of current; interpretation of the test results. (L12g; ST, 4-3)

410-L. (German.) **Manufacture of Thin Aluminum Layers Using Snort Vapor Periods.** Reinhold Gerharz. *Zeitschrift für Angewandte Physik,* v. 9, Feb. 1957, p. 95-98.

Metallic vapor in a high vacuum propagated toward a vapor source in spherical, beam or cylindrical shape has been investigated. Aluminum vapor with a large diffusion pressure velocity is suitable for producing a thin condensation layer with high optical properties and mechancal adhesion in the shadow of the obstacle. 12 ref. (L25g; *Al*)

411-L. We Cut Polishing Costs 35%. A. D. Vanderbilt. *American Machinist,* v. 101, May 6, 1957, p. 120-121.

Process for polishing die cast aluminum parts involves dipping in acid and tumbling with steel burnishing balls in a soap solution. (L10b, L10d; Al, 5-11)

412-L. Electroforming Thin Films to Close Tolerances. Robert W. Hampson. *American Machinist,* v. 101, June 17, 1957, p. 121-123.

Reticles and other optical electronic components have patterns of digits and letters electroformed in matrix by plating 0.0001-in. nickel on a beryllium-copper base only 0.0015 in. thick. (L18; Ni, Be, Cu, 14-12)

413-L. Precision Barrel Finishing. Pt. 1. William E. Brandt. *Automatic Machining,* v. 18, June 1957, p. 43-46.

Action taking place in barrel; its use in precision finishing of parts; process development and the use of improved aluminum oxide chips as barreling media. (L10d)

414-L. Hot-Dip Galvanising Furnaces Heated by Forced Circulation of Exhaust Gas. Josef Kohlgruber. *Draht (English Edition)* no. 29, June 1957, p. 26-32.

Detailed description of furnaces and plants. Heat consumption data of wire, sheet, strip, tube and piece goods galvanizing plants. (L16, 1-2; *Zn*)

415-L. Electroplating Screws and Other Small Parts. Werner Peters. *Draht (English Edition),* no. 29, June 1957, p. 33-39.

Various electroplating systems in use for galvanizing screws; thickness of the deposit, quality and dimensional accuracy; sequence of preliminary operations; surface treatment; degassing, surface activation. (To be continued.) (L17, T7f; ST, *Zn*)

416-L. New Design of Shot-Blast Plant. R. Michie. *Foundry Trade Journal,* v. 102, May 30, 1957, p. 671-673.

Shot blast unit, material handling arrangements, dust collection, compressed air supply in shot blast plant for cleaning steel castings. (L10c; ST, 5-10)

417-L. Cleaning and Treating Metals to Be Painted. Pt. 2. P. C. Bardin. *Industrial Finishing,* v. 33, June 1957, p. 42-54, 58.

Condition of metal surfaces following blast cleaning, types of phosphate coating, their value and methods of application, sequence of advance in multiple stage washers, use of ultrasonic cleaning and note on anodizing of aluminum. (L10, L12, L14b, L19)

418-L. Airless Abrasive Blasting Eliminates Acid and Disposal Problems in Metal Cleaning. *Industrial Improvement,* v. 31, June 1957, p. 10-11, 16-17.

The main types of airless blasting machines are the tumble-blast type, the table type and special ones tailor-made for specific cleaning problems. Advantages and applications of this process; comparison with the use of acids! examples of autual use. (L10c, 1-2)

419-L. Why Not Tumble Big Parts? W. E. Brandt. *Iron Age,* v. 179, June, 20, 1957, p. 91-94.

Large, heavy objects are usually tumbled by fixture technique. High chip load, low speed, ample cushioning are essential. For uniform results, barrel rotation must be reversed midway. (L10d)

420-L. Should Job Shop Platers Automate? Julian Nelkin. *Iron Age,* v. 179, May 9, 1957, p. 118-119.

Note on automated electroplating in barrels with procedures for plating cadmium. (L17, 18-24; *Cd*)

421-L. Anodic Oxidation of Aluminum, Chromium, Hafnium, Niobium, Tantalum, Titanium, Vanadium and Zirconium at Very Low Current Densities. Herman A. Johansen, George B. Adams, Jr., and Pierre Van Rysselberghe. *Journal of the Electrochemical Society,* v. 104, June 1957, p. 339-346.

Examination of the mode of formation of anodic oxidation films in the potential region below oxygen evolution. Electrolytic parameters and formation fields were evaluated from the unitary formation rates. 33 ref. (L19; Al, Cr, Hf, Cb, Ta, Ti, V, Zr)

422-L. Effects of Various Polyvalent Metal Anion Additions to an Alkaline Magnesium Anodizing Bath. W. McNeill and R. Wick. *Journal of the Electrochemical Society,* v. 104, June 1957, p. 356-359.

Hardness, dielectric strength, and corrosion resistance were determined. Coatings from chromate, stannate, vanadate, tungstate and manganate baths were compared with those from a bath containing no polyvalent metal anion. 7 ref. (L19; Mg)

423-L. Barrel Finishing—How and When to Use It. Lester F. Spencer. *Metal Finishing,* v. 55, May 1957, p. 48-54.

Examples of variety of steel, zinc, aluminum, brass and other parts which may be cleaned, deburred or finished by barreling; variables influencing barreling results with recommendations for their regulation; mechanical action in barrel, selection of abrasive media and barreling equipment. 7 ref. (L10d, 1-2; ST, Zn, Al, Cu-n)

424-L. Surface Treatment and Finishing of Light Metals. Pt. 12-E. Plating on Aluminum—Hard Chromium and Non-Electrolytic Deposits. S. Wernick and R. Pinner. *Metal Finishing,* v. 55, May 1957, p. 55-59, 64.

Methods and solutions for chemical etching prior to plating; solutions for depositing chromium on aluminum, methods of surface preparation and solutions for deposition of tin, silver and nickel on aluminum. 33 ref. (L17, L29; Al, *Cr, Sn, Ag, Ni*)

425-L. Finishing Pointers. The Water Separator in Vapor Degreasing. Max Randall. *Metal Finishing,* v. 55, May 1957, p. 60, 64.

Effect, sources and methods of removal of water present in solvent used for removing grease and oil from metal products. (L12j)

426-L. Modern Chlorate-Accelerated Phosphating Bath. Edward Heinzelman, Jr. *Metal Finishing,* v. 55, May 1957, p. 61-64.

Discusses nitrate and chlorate accelerators and their action in promoting the phosphate reaction with metal being coated; corrosive effect of accelerators and performance of phospnate coatings formed by nitrate and chlorate accelerate baths on SAE 1010 cold rolled steel. 5 ref. (L14b; CN)

427-L. Science for Electroplates. Pt. 24. Chemical Surface Preparation. C. L. Serota. *Metal Finishing,* v. 55, May 1957, p. 65-67.

Acid pickling, acid dips and brighteners and inhibitors for reducing action of pickling solution on metal; methods of evaluating alkaline cleaners including wiping test, water-break test, spray pattern, atomizer test, fluorescent dye, radiotracer and chemical tests. (L12, 1-4)

428-L. Vitreous Enameling of Aluminum. N. G. Guy and A. H. Symonds. *Metal Finishing Journal,* v. 3, May 1957, p. 195-198.

New developments discussed at annual refresher course in vitreous enameling organized by Ferro Enamels, Ltd. (L27; Al)

429-L. Chromium Plating of Gun Barrels. R. A. F. Hammond. *Metal Finishing Journal,* v. 3, May 1957, p. 203-207.

Processes, treatment of abnormal barrels, and description of only English plant which plates large gun barrels. (L17, T2m; *Cr*)

430-L. Cleaning of Intricate Parts. H. Silman and J. E. Entwistle. *Metal Finishing Journal,* v. 3, May 1957, p. 209-212.

Ultrasonic cleaning of watch parts. (L10f)

431-L. Experiences and Problems in the Surface Treatment of Zinc and Aluminum Die Castings. H. Ruegg. *Metal Finishing Journal,* v. 3, June 1957, p. 229-240, 262.

Pretreating, painting, etching, coloring, phosphating, electroplating, chromium plating and anodizing employed by Injecta A. G. 38 ref. (L general; Zn, Al, 5-11)

432-L. Blasting With Crushed Walnut Shell. William D. Stampfli and W. Reece Baughn. *Metalworking Production,* v. 101, May 31, 1957, p. 933-935.

Pellets prepared by crushing and screening English walnut shells used in centrifugal blasting units for cleaning and deburring cast iron, steel and die-cast aluminum parts. (L10c; CI, ST, Al)

433-L. General Practices of Metal Surface Prepaint Preparation. J. H. Geyer. *Official Digest,* v. 29, June 1957, p. 533-541.

Principal chemical prepaint treatments for metals current in use. (L26n)

434-L. Removing Rust and Scale by Abrasive Cleaning. Edmund Jacobson. *Organic Finishing,* v. 18, June 1957, p. 9-11.

Procedure and saving in manhours with airless abrasive blasting. (L10c)

435-L. Glossary of Barrel Finishing Terms. *Precision Metal Molding,* v. 15, July 1957, p. 51-53.

An industry-wide cooperative project. (L10d; 11-17)

436-L. Phosphating Processes and Their Applications in Metal Finishing. D. J. Fishlock. *Product Finishing,* v. 10, June 1957, p. 65-76.

Early developments, recent progress and theory of phosphating. (L14b)

437-L. Plating Steel With Molybdenum. *Steel*, v. 140, May 20, 1957, p. 161 and 164.

System for plating molybdenum on inside surface of tubes made of AISI 4620, Hastalloy for some stainless steels; vaporized molybdenum pentachloride reduced to form coating. (L17; AY, SS, *Mo*)

438-L. Decontamination of Stainless Steel. D. O. Campbell. Oak Ridge National Laboratory. *U. S. Atomic Energy Commission*, ORNL-1826 (Del.), Mar. 2, 1955, 42 p.

The contamination on stainless steel exposed to Purex process solutions is predominantly columbium, which is also the most difficult contaminant to remove. Zirconium accounts for a few percent of the contamination, and other fission products are relatively unimportant. The most effective noncorrosive decontaminant was alkaline tartrate-peroxide. After the initial application of this reagent, its action was improved by a pretreatment of the contaminated surface with nitric acid. 54 ref. (L12; SS)

439-L. Electroplating Baths for Ultra-High-Strength Steels. Pt. 1. Use of Aliphatic Amino Acids in Cadmium Baths to Reduce Hydrogen Embrittlement. P. N. Vlannes, S. W. Strauss and B. F. Brown. Naval Research Laboratory. *U. S. Office of Technical Services*, PB 121836, Mar. 1957, 15 p. 50¢.

Electroplating high-strength steels from an ammoniacal bath containing salts of amino acids results in markedly lower hydrogen embrittlement than plating from the standard cyanide bath. Plating characteristics of aqueous cadmium baths containing six aliphatic amino acids were studied. Satisfactory plates were made from ammoniacal solutions of glycinate, beta-alaninate, n-butyrate and isobutyrate. (L17a; ST, SGB-a)

440. L. Study of Cadmium-Tin and Zinc-Tin Alloy Electrodeposits. B. Cohen. Wright Air Development Center. *U. S. Office of Technical Services*, PB 121808, Sept. 1956, 44 p. $1.25.

Cadmium-tin electrodeposits were found superior to coatings of cadmium in both corrosion resistance and embrittling effects. The alloy systems evaluated were deposited from fluoborate solutions. The cadmium-tin coating showed excellent resistance to salt spray, jet fuels, high-temperature synthetic oils and organic acid vapors. The coating had very little embrittling effect on steel as compared to cadmium plated from a cyanide solution. It was easily soldered by the same techniques used for cadmium. Zinc-tin alloy coatings were inferior in all tests to those of both cadmium and cadmium-tin.
(L17, R general, Cd, Sn, Zn, 8-12)

441-L. Field Tests Are Still Best for Hard Facing. D. B. Rankin. *Welding Engineer*, v. 42, June 1957, p. 52-53.

Limitations of laboratory tests and considerations when making field tests. (L24, 1-4)

442-L. Polarization Measurements for Improved Pickling Practices in Steel Industry. K. H. Brakstad. *Jernkontorets Annaler*, v. 140, 1956, p. 512-519. (*Henry Brutcher Translation*, no. 3907).

Previously abstracted from original. See item 655-L, 1956. (L12, ST)

443-L. Reactions Involved in the Impregnation of Steel Surfaces With Metals. V. A. Illarionov. *Metallovedenie i Obrazotka Metallov*, no. 3, Mar. 1957, p. 2-8. (*Henry Brutcher Translation* no. 3967).

Reactions underlying metallic surface impregnation of steel by formation of a volatile metal compound (e.g., chloride) on steel surface and chemical reaction therewith, accompanied by enrichment of steel surface with the particular metal; experiments on pack and gas aluminizing to study the mechanisms of chemical transfer of aluminum. (L15; ST, *Al*)

444-L. (French.) **Control of Optimum Conditions for Electrolytic Polishing of Semiconductors.** I. Epelboin and M. Froment. *Journal de Physique et le Radium*, v. 18, Mar. 1957, p. 60A-61A.

Three types of baths can be used for both metals and semiconductors, but control methods are different because of relative resistivities of materials to be polished. 4 ref. (L13p; SGA-r)

445-L. (German.) **Surface Treatment Directions for Finishing.** E. Reenebach. *Fertigungstechnik*, v. 7, Feb. 1957, p. 83-86.

A compilation of standardized finishing instructions as used by Carl Zeiss, Jena, Germany.
(L general, S22)

446-L. (German.) **Immersion (Gunbarrel Oxidizing) of Steel and Cast Iron.** H. Kohlhase. *Fertigungstechnik*, v. 7, Feb. 1957, p. 87-90.

Characteristics, historical development, sequence of operation, difficulties encountered, corrosion prevention under various conditions. (L14a; ST, CI)

447-L. (German.) **History, Fundamentals and Application of Phosphate Coatings.** O. Borchert. *Fertigungstechnik*, v. 7, Apr. 1957, p. 146-152.

Chemical fundamentals; hot phosphate coating: phosphoric acid bath without accelerators, phosphoric acid bath with accelerators; accelerators used: nitrites, nitrates, chlorates, chromates, potassium permanganate, reducing compounds; cold phosphate coating; acceleration according to Mahu's theory; properties of phosphate coatings; phosphate coating of nonferrous metals—zinc and alloys, aluminum and alloys; technical applications. 32 ref. (L14b; Zn, Al)

448-L. (German.) **Survey of Fine Finishing.** *Fertigungstechnik*, v. 7, Apr. 1957, p. 166-170.

Fine grinding, spray lapping, electrolytic polishing, roll flattening, tolerances and surface roughness. 12 ref. (L10b, L13p, S14)

449-L. (German.) **Application of Ultrasonics.** H. Bennighoff. *Fertigungstechnik*, v. 7, May 1957, p. 225-233.

Ultrasonics has been used successfully for cleaning of metal surfaces, nondestructive testing and drilling. Description and illustration of many types of apparatus.
(L10f, S13g, G24c, 1-3)

450-L. (German.) **Electroless Nickel Plating in Practice.** L. Bosdorf. *Metallwaren-Industrie und Galvanotechnik*, v. 48, Jan. 1957, p. 1-10.

Composition of baths; the chemical reaction; temperature, pH value and deposition time of the bath; hardness of deposit; suitable metals; electroless nickel plating of plastics and glass; layer thickness testing; composition and properties of the deposit; corrosion resistance; detailed preparation for plating. 58 ref. (L28; *Ni*)

451-L. (German.) **Fundamental Calculations in Electroplating Practice. Pt. 1.** Walter Nohse. *Metallwaren-Industrie und Galvanotechnik*, v. 48, Jan. 1957, p. 17-22.

Definitions of various time factors in the operation of electroplating plants and mathematical formulas for each factor. 4 ref. (L17b)

452-L. (German.) **Filtration in Electroplating. Pt. 3.** Erich Stöcker. *Metallwaren-Industrie und Galvanotechnik*, v. 48, Jan. 1957, p. 23-27.

Filters available to the industry are of the following types: horizontal surface, vertical columns, vertical layers, fluted "meta" filters. Commercial filters now available are discussed. (L17, 1-2)

453-L. (German.) **Influence of Raw Materials on Electroplating.** A. v. Krusenstjern. *Metallwaren-Industrie und Galvanotechnik*, v. 48, Jan. 1957, p. 28-30.

The baser the metal the greater the danger of oxide formation and porosity, inner stress and difficulties in grinding, polishing and finishing. 7 ref. (L17; RM)

454-L. (German.) **Corrosion Resistance of Glossy Zinc Deposits.** Hans-Joachim Brinkmann and Emil Knoll. *Metallwaren-Industrie und Galvanotechnik*, v. 48, Jan. 1957, p. 31-33.

Two factors are of importance in retarding corrosion in galvanizing: 1) thickness of the zinc layer and passivation treatments, and 2) length of interval between individual procedures and intensity of rinsing. (L16, R general; *Zn*)

455-L. (German.) **Cadmium as a Brightener in the Nickel Bath.** Walter Oehlerking. *Metallwaren-Industrie und Galvanotechnik*, v. 48, June 1957, p. 264-265.

Experiments on operation conditions under which cadmium addition to nickel bath results in bright nickel deposits. (L17a; *Ni, Cd*)

456-L. (German.) **Significance of pH Values in Electroplating.** Paul Lenhard. *Metallwaren-Industrie und Galvanotechnik*, v. 48, June 1957, p. 266-269, 272.

An explanation of pH values, pH measurement by colorimetry, buffer action of boric acid, application to cyanidic copper baths, brass baths, nickel baths. (L17a; *Cu, Ni*)

457-L. (German.) **Longer Tool Life and Economy Through Building up Tool Tips by Welding.** Karl Schmidt. *Schweissen und Schneiden*, v. 9, June 1957, p. 277-278.

Tool wear can be greatly reduced by applying a hard wear resistant metal to the tool tip. Materials for surfacing are tungsten carbide powder, chromium manganese alloys, cast or sintered carbides. When oxy-acetylene welding is used preheating is essential, but this is not necessary in the case of electric arc welding. Due to dispersion in the parent metal tungsten carbide applied by arc welding does not reach the same hardness after application as before. (L24, T6n; SGA-m)

458-L. (Japanese.) **Hydrogen Over-Voltage and Oxygen Over-Voltage With Nickel and Tin Alloy Electrode in Alkaline Solution.** Kumazo Sasaki and Kozo Sugiyama. *Chemical Society of Japan, Journal, Industrial Chemistry Section*, v. 60, Apr. 1957, p. 383-386.

Measurement of hydrogen and oxy-

gen over-voltage with nickel and tin electrodes in a solution of 6*N* caustic soda. The following results were observed: (a) relationship between hydrogen over-voltage and current density; (b) minimum point of oxygen at 59% nickel; (c) minimum point of hydrogen over-voltage at 34 to 60% nickel. (L17b; *Ni, Sn*)

459-L. (Japanese.) **Hydrogen and Oxygen Over-Voltage With Nickel and Zinc Alloy Electrodes in an Electrolyte of Sulphuric Acid.** *Chemical Society of Japan, Journal, Industrial Chemistry Section,* v. 60, Apr. 1957, p. 387-392.

Hydrogen and oxygen over-voltage measurement in 20% sodium sulphate; the relationship between current density and cathode electrode potential; relationship between current efficiency and current density; relationship between hydrogen over-voltage and current density, oxygen over-voltage and current density. (L17a; Cu)

460-L. (Russian.) **Method of Coating the Surfaces of Heated Metals With Titanium.** A. N. Sysoyev and A. K. Beskrovnyy. *Byulleten Izobreteniy,* no. 1, Jan. 1957, p. 48.

Titanium coating by means of thermal decomposition of titanium iodides in a vacuum differs from other methods in that the processing is carried out by the application of high-frequency current heating. (L28, 1-19; *Ti*)

461-L. (Russian.) **Quality of Surface and Uniformity Obtained by Removal of Metal With Abrasive Fluid.** S. M. Bilik. *Stanki i Instrument,* v. 28, Jan. 1957, p. 16-20.

An abrasive fluid is applied against the surface through a jet nozzle. The fluid is made up of 1 part of abrasive and 4 of water, and is ejected by compressed air. The grade of abrasive, size of the orifice and angle of attack influence cutting power. (L10g)

462-L. (Russian.) **Copper Plating in Fluoroborate Electrolytes.** B. I. Layner and Y. A. Velichko. *Vestnik Mashinostroeniia,* v. 37, Apr. 1957, p. 60-64.

This method of copper plating permits the use of greater current density and a finer deposition of copper than is usual in sulphuric acid baths. It may be applied for plating pipes, plates, strips, and whenever heavy deposition of copper is required. Iron cannot be plated directly, for an undercoating of nickel or copper first needs to be deposited in a cyanide bath. (L17a; Cu)

463-L. (Russian.) **Use of Iron Plating in the Repair of Machine Parts.** V. P. Rebyakin and P. D. Myasnikov. *Vestnik Mashinostroeniia,* v. 37, Apr. 1957, p. 64-65.

The electrolyte is composed of iron chloride, manganese chloride and hydrochloric acid. The cohesion of the iron deposit is very firm and may reach 5-6 mm. in thickness. (L17, 18-22; *Fe*)

464-L. (Russian.) **Toughening of Low-Alloy Steel Surfaces by Boronizing.** V. D. Taran and L. P. Skugorova. *Vestnik Mashinostroeniia,* v. 37, May 1957, p. 62-65.

A crucible made of stainless steel is filled with borax. After melting the borax the electrodes are introduced. The anode is carbon and the cathode is the work piece itself. As a result of electrolysis, elementary boron is liberated which immediately diffuses in the metallic surface as iron boride. The thickness of the borated surface depends on the length and temperature of the process. 6 ref. (L15; AY, *B*)

Metallography

Constitution and Primary Structures

246-M. Bismuth in Copper Grain Boundaries. C. W. Spencer, R. A. Rummel and F. N. Rhines. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, June 1957, p. 793-794.

Five cast copper-bismuth alloys containing 4.68, 0.53, 0.043, 0.0064 and 0.0025% Bi were subjected to bend tests and structures of fractured surfaces were compared with those of polished cross sections by metallographic methods. Embrittlement found to be associated with phase in grain boundaries. 5 ref. (M27f; Cu, *Bi*)

247–M. Grain-Boundary Carbides in Extra-Low-Carbon Stainless. R. O. Steiner and P. S. Trozzo. *Metal Progress,* v. 72, July 1957, p. 108-110.

A "sensitizing" heat treatment precipitates complex carbides, $(Fe, Cr)_{23}C_6$, whose locus favors one of the abutting grains. (M27d, M21e, M22h, 1-4; SS, 14-18)

248-M. Dislocations and Plastic Properties of Metals. J. Philibert. *Metal Progress,* v. 72, July 1957, p. 146-148. (Digest from *Metaux-Corrosion-Industries,* no. 368, Apr. 1956, p. 154-166.)

Previously abstracted from original. See item 226-M, 1956. (M26b, Q21, Q23)

249-M. Stacking Faults in Face-Centered Cubic Metals and Alloys. R. E. Smallman and K. H. Westmacott. *Philosophical Magazine,* v. 2, May 1957, p. 669-693.

Stacking faults on the (111) planes of several face-centered cubic metals and alloys have been introduced by cold work, and estimates of the stacking fault probability, x, have been obtained from changes produced in the Debye-Scherrer spectrum. The faulting probability increases on alloying, from one plane in 300 in copper, to one plane in 25 for some high solute content alloys containing zinc, aluminum, tin or germanium. Both neutron irradiation (5 x 10 n.v.t.) and "quenched-in" vacancies have little significant effect on the faulting parameter. 22 ref. (M26s)

250-M. The Axial Ratio of Zinc, and of the Eta and Epsilon Brasses. F. R. N. Nabarro. *Philosophical Magazine,* v. 2, May 1957, p. 716-718.

The changes of lattice parameters within either the epsilon or the eta phase can be accounted for only by taking into consideration the effects of the Brillouin zone, and probably other factors. On the other hand, the Brillouin zone effects will not account for the transition from epsilon to a highly prolate structure, although they may modify the behavior of this transition considerably. (M26; Zn, Cu-n)

251-M. On the Relation Between Bond Hybrids and the Metallic Structures. S. L. Altmann, C. A. Coulson and W. Hume-Rothery. *Royal Society, Proceedings,* v. 240, May 21, 1957, p. 145-159.

The failure of existing theories to account for the type of crystal structure of a given metal is emphasized. It is suggested that, particularly when the number of bonding electrons is high, the metallic bond has greater directional characteristics than are generally assumed, and that those can be related to the symmetries of known hybrid bonds. Consideration is given to the face-centered cubic, body-centered cubic and close-packed hexagonal structures of the transition metals, and it is shown that the hybrids suggested by the crystal structures can be correlated with the known electron characteristics of these metals. 19 ref. (M26)

252-M. An Introduction to High Speed Steel. Howard E. Boyer. *Steel Processing,* v. 43, June 1957, p. 324-325, 351.

Compositions of four typical high speed steels; temperature effects from 2000-2350° F. on microstructure. (M27, 2-12; TS-m)

253-M. Part of the Five-Component System Nickel-Chromium-Tungsten-Titanium-Aluminum. I. I. Kornilov, L. I. Pryakhina and O. V. Ozhimkova. *Academy of Sciences of the USSR, Bulletin, Division of Chemical Science,* no. 8, Aug. 1956, p. 907-909. (Columbia Technical Translations.) (CMA)

Previously abstracted from the original. See item 473-M, 1956. (M24, Q general, Ni, Al, Ti, W, Cr)

254-M. (French.) **Study of Lanthanum-Aluminum Alloys.** Francoise Guame-Mahn and Micheline Cohen. *Centre National de la Recherche Scientifique, Journal des Recherches,* v. 38, Mar. 1957, p. 64-71. (CMA)

Compounds in the system La-Al were prepared both by the fusion of the metals and by treating aluminum with lanthanum fluoride and reducing with calcium. The formation of the compounds La_3Al, $LaAl$, $LaAl_2$ and $LaAl_4$ was confirmed. Their density increases with the lanthanum content. $LaAl_4$ has two phases with a transition point at 816° C.; $LaAl_4$ alone is diamagnetic. In another series of experiments the end of the phase diagram representing alloys with low lanthanum contents (0.1-5%) was investigated. It was found that the solubility of lanthanum in aluminum is low, not exceeding 0.25% La and that the mechanical properties of aluminum are not appreciably improved by the addition of lanthanum. This is evidently due to the large difference in atomic radii of aluminum and the cerium group of rare earths. Possibly rare earths of higher atomic weights, for which this difference is smaller, will be found to be more effective agents in improving the properties of aluminum. 12 ref. (M24b, Q general, 2-10; Al, *La*)

255-M. (French.) **Film Mounts and Printing Techniques in Electron Microscopy. Pt. II.** Roger Dargent. *Métaux–Corrosion-Industries,* v. 32, May 1957, p. 191-200.

Replica techniques; formvar prints; methods of single and double prints; aluminum-carbon and formvar-carbon prints; operating procedures. (To be contiued.) (M20r)

256-M. (French.) **Nondestructive Macrographic Examination of Annealing on Mild Steel Welds.** H. Granjon. *Soudage et Techniques Connexes,* v. 11, May-June 1957, p. 189-193.

Method for macrographic etching on the outside of fusion welded assemblies, applicable more particularly to liquefied gas cylinders, renders it possible to check to what extent the normalizing treatment is efficiently performed. Comparison with the data given by the macrographic examination of sections and micrographic inspection.
(M28p; CN, 7-1)

257-M. (German.) **Preparation of Metallographic Etchings of Copper Alloys Through "Overcutting" With Mikrotom and Electrolytic Polishing.** G. Reinacher. *Metall,* v. 11, July 1957, p. 593-598.

"Overcutting" with a cutting blade (Mikrotom) and electrolytic polishing are used independently or in combination, eliminating other grinding and polishing operations. This results in considerably improved clarity of etching of copper and copper alloys and in timesaving in the preparation of specimens. Demonstrated on copper with Cu_2O inclusions, on brass of different contents, on bronze and copper-beryllium alloys. 11 ref. (M20; Cu)

258-M. (German.) **Morphology of Surfaces of V2A Steel Polished by the Use of Gases.** E. Brüche and K. J. Schulze. *Metalloberfläche,* v. 11, June 1957, p. 181-189.

The optimal polishing point of V2A steel (18% chromium, 9.5% nickel, 0.1% carbon, more than 0.4% titanium and the remainder iron) lies at 50° C. in gas consisting of NO_2:HCl:H_2O = 30:60:10 molar ratio. Extensive details are given with ternary diagrams and electron microscopic photographs. 3 ref.
(M20p; SS)

259-M. (German.) **Contribution to the Knowledge of the System Cerium-Aluminum.** Jan H. N. van Vucht. *Zeitschrift für Metallkunde,* v. 48, May 1957, p. 253. (CMA)

Earlier investigators claimed the existence of Ce_3Al_2 in the cerium-rich phase of the binary system Ce-Al, but no Ce_3Al or Ce_2Al. In the present investigation of the Ce-Al system in the range above 50 at.% Ce, using X-ray diffraction, thermo-analytic and microscopic methods, two modifications of Ce_3Al were observed: a hexagonal Ni_3Sn structure below 230° C. and a cubic Cu_3Au structure above that temperature. The presence of Ce_2Al or Ce_3Al_2 could not be confirmed. 8 ref.
(M24b; Ce, Al)

260-M. (Russian.) **Study of the Phase Diagram of the System Zirconium-Boron. Pt. I.** V. A. Epelbaum and M. A. Gurevich. *Zhurnal Fizicheskoi Khimii,* v. 31, Mar. 1957, p. 708-711. (CMA)

In the zirconium-boron phase diagram the high-zirconium region with predominating zirconium was investigated chemically and roentgenographically. The solid solution of boron in α-Zr has a limit at about 2 at.% B, the parameters of the hexagonal lattice changing from a = 3.232 Å, c = 5.140 Å to a = 3.253 Å, c = 5.191 Å. These findings disagree with data of Post and Glaser, who report for the higher limit of c the much larger value c = 5.57 Å. 7 ref. (M24b; Zr, B)

261-M. Characteristic Temperatures of Cubic Metals. E. E. Budzinski and H. Schiff. *Canadian Journal of Physics,* v. 35, May 1957, p. 507-511.

An approximation is developed for the determination of the characteristic Debye temperature of cubic crystals. 3 ref. (M26)

262-M. Defect Structure and the Temperature Dependence of Hardness of an Intermetallic Compound. J. H. Westbrook. *Journal of the Electrochemical Society,* v. 104, June 1957, p. 369-373.

Silver-magnesium system studied from −190° C. to the solidus temperature over the entire homogeneity range. Results appear to rationalize previously contradictory studies of the effect of defect structure on the room-temperature strength of intermetallic compounds. 35 ref.
(M26q; Ag, Mg)

263-M. Observation of Precipitates and Inclusions in Steel by Extraction Replica Technique. Iku Uchiyama, Akira Fukami and Shinjiro Katagiri. *Journal of Electromicroscopy,* v. 5, 1957, p. 28-33.

Some inclusions (oxides, sulphides, etc.) and precipitates (carbides) in steel were observed by extraction replica technique using evaporated carbon film. A new method was used in which sodium chloride crystals were placed on replica film as standards. 7 ref. (M20r; ST, 9-19)

264-M. Effects of Compression and Annealing on the Structure and Electrical Properties of Germanium. E. S. Greiner, P. Breidt, Jr., J. N. Hobstetter and W. C. Ellis. *Journal of Metals,* v. 9; *AIME Transactions,* v. 209, July 1957, Sec. 2, p. 813-818.

Study revealed the operation of the postulated dislocation mechanism of plastic flow. No evidence of recrystallization was found, but a domain structure composed of small-angle boundaries was formed by large deformations at high temperatures. Annealable acceptor centers apparently due to point defects were found and studied. 31 ref.
(M27g, P15, 2-14; Ge)

265-M. Further Contribution to the Crystallographic Angles for Bismuth and Antimony. W. Vickers. *Journal of Metals,* v. 9; *AIME Transactions,* v. 209, July 1957, Sec. 2, p. 827-828.

Tables of angles between directions and angles between planes for bismuth, which are also applicable to antimony, as its axial angle is only 10′ less than that of bismuth. 3 ref. (M26n; Bi, Sb)

266-M. X-Ray Diffraction Study of the Sigma Phase in the Systems Re-Cr, Ru-Cr, and Os-Cr. R. M. Waterstrat and J. S. Kasper. *Journal of Metals,* v. 9; *AIME Transactions,* v. 209, July 1957, Sec. 2, p. 872-873.

X-ray patterns for the three sigma phases are given. While intensity comparisons may not be extremely good, there is no positive indication of highly ordered atomic distributions. 4 ref.
(M26, M24b; Re, Ru, Os, *Cr*)

267-M. Elevated Temperature Phase Relationships in the Cr-Ni-Mn-N System. E. J. Whittenberger, E. R. Rosenow and D. J. Carney. *Journal of Metals,* v. 9; *AIME Transactions,* v. 209, July 1957, Sec. 2, p. 889-895.

Austenite-austenite plus delta ferrite phase boundaries determined for Cr-Ni-Mn-N system at temperatures of 2100, 2200 and 2300° F. over composition ranges 15 to 21% Cr, 0 to 3% Ni, 12 to 18% Mn, and 0.25 to 0.45% N. Structural diagrams permit selection of ferrite-free stainless compositions containing little or no nickel. 6 ref.
(M24d, N8, 2-12; SS)

268-M. Intermetallic Compounds in Titanium-Hardened Alloys. H. J. Beattie, Jr., and W. C. Hagel. *Journal of Metals,* v. 9; *AIME Transactions,* v. 209, July 1957, p. 911-917. (CMA)

The nickel-chromium alloy A-286, as hardened by titanium, was studied using light and electron microscopy and X-ray and electron diffraction. The phase relations revolve around the tendency of excess nickel to leave the matrix and combine with γ', η and G phases (G-phase is a bulky nickel-titanium silicide, probably $Ni_{16}Ti_6Si_7$, resulting from grain-boundary segregation). Interatomic distances in the G-phase are not short. When the silicon content is negligible, a new phase precipitates instead of the G and Laves phases. 8 ref.
(M26q; Ni, SGA-h, *Ti*)

269-M. Determination of Orientation of Magnesium by Polarized Examination. S. L. Couling and G. W. Pearsall. *Journal of Metals,* v. 9; *AIME Transactions,* v. 209, July 1957, Sec. 2, p. 939-940.

Specimens were etched 6 to 8 sec. in an acetic picral solution. Metallograph used permitted insertion of an adjustable full-wave retardation plate between specimen and polarizer. 4 ref. (M26c, X4a, 1-3; Mg)

270-M. Thermodynamics of the Cu-Fe-S System at Matte Smelting Temperatures. W. A. Krivsky and R. Schuhmann, Jr. *Journal of Metals,* v. 9; *AIME Transactions,* v. 209, July 1957, Sec. 1, p. 981-988.

Sulphur activities were measured as a function of phase compositions in three major regions in the Cu-Fe-S system at temperatures from 1150-1350° C. Data generally confirm previously published phase diagrams for the Cu-Fe-S system in above range and establish more accurately locations of the liquid metal-liquid matte immiscibility region and the terminus of this region with two liquids in equilibrium with the gamma-iron alloy phase. 19 ref.
(M24c, P12; Cu, *Fe, S*)

271-M. Constitution of Delta-Phase Alloys of the System U-Zr-Ti. H. A. Saller, F. A. Rough, A. A. Bauer and J. R. Doig. *Journal of Metals,* v. 9; *AIME Translations,* v. 209, July 1957, Sec. 2, p. 878-881.

At all temperatures investigated, a maximum of two phases was found to exist either metallographically or by X-ray. No evidence found for presence of a three-phase region. Constitution diagram for section, ranging from 74 at. % Zr to 35 at. % Ti, is proposed. 3 ref.
(M24c; U, *Zr, Ti*)

272-M. Occurrence of the Beta-Manganese Structure in Transition Metal Alloys and Some Observations on Chi-Phase Equilibria. H. J. Goldschmidt. *Metallurgia,* v. 56, July 1957, p. 17-26.

New intermetallic compound of beta-manganese structure occurs in the Fe-Cr-W-C system. The phase is stable close to the melting point and is associated with the chi-phase of alpha-manganese structure. 17 ref. (M26q; Mn)

273-M. Overheating Effects in High Strength Aluminum Alloys. T. R. G. Williams. *Metallurgia,* v. 56, July 1957, p. 33-37.

Comparison of microstructures of Al-Cu-Mg-Si alloys overheated at both the homogenization and solution heat treatment stages reveals rosettes of liquated material in both; liquation films at grain boundaries during preheating, whereas the films are present at the boundaries of the recrystallized grain in solution heat treatment. 4 ref.
(M27f, 2-14; Al, 9-23)

274-M. A New Phase Structure of Molybdenum. P. S. Aggarwal and A. Goswami. *Physical Society, Proceedings,* v. 70, no. 451B, July 1, 1957, p. 708-710. (CMA)

A face-centered cubic structure has been observed in molybdenum deposited in vacuo; heretofore, only the body-centered cubic modification was known. Electron diffraction shows that the deposits formed on rocksalt in about 10 min. were in two-degree (100) and (111) orientations. The pattern showed spots and rings, the hkl values of which were all odd or all even.
(M26n; Mo)

275-M. Phase and Free Energy Relationships in the System Titanium-Zirconium-Oxygen. M. Hoch, P. Walsh and Yao Chiang. *Wright Air Development Center,* Technical Report 56-567. *U. S. Office of Technical Services* PB 121981, Jan. 1957. 32 p. (CMA)

The Ti-Zr-O system is not only of theoretical interest, but is of interest in the study of cermets because of the ZrO_2 phase. Apparatus and materials used in the phase study are described, the phase diagram is presented and discussed, and the activity of the Zr-ZrO_2 binary was measured. (M24c, P12a; Ti, Zr, O)

276-M. (English.) **On the Superstructure of the Ordered Alloy Cu-Pd. Pt. 2. X-Ray Diffraction Study.** Makoto Hirabayashi and Shiro Ogawa. *Physical Society of Japan, Journal,* v. 12, Mar. 1957, p. 259-271.

According to X-ray diffraction study on the ordered Cu_3Pd crystals it was confirmed that the two-dimensional anti-phase superstructure characterized by two kinds of step shift exists in stable form in the compositions of 27.3 and 28.5% Pd after slow cooling from 450° C. to room temperature over a period of four months. The alloys containing 20.8 to 25.8% Pd, which were also annealed for four months, have the one-dimensional anti-phase superstructure. 12 ref.
(M26q; Cu, *Pd*)

277-M. (French.) **Contribution to the Study of Copper-Beryllium Alloys.** Arunachala Viswanathan. *Journal des Recherches du Centre National de la Recherche Scientifique,* no. 37, Dec. 1956, p. 303-318.

Structure of metallic films formed on these alloys depends greatly on their thickness. Electron diffraction photography was used to study structures. 14 ref.
M27d, M22h; Cu, *Be.* 14-12)

278-M. (Japanese.) **Microstructure of Rolls for Cold Rolling. Pt. 2.** Takuo Ando, Keiya Gokan and Kenichi Arase. *Iron and Steel Institute of Japan, Journal,* v. 43, Apr. 1957, p. 451-456.

By water quenching after 3 hr. at 860° C., specimens which had been completely spheroidized showed properly distributed carbides in fine martensite matrix. Optimum conditions for the structure and hardness were found in the neighborhood of 860° C. 6 ref. (M27d, 2-14, W23k; ST)

279-M. (Japanese.) **Studies on Cr-Mo-Fe Super-Heat Resisting Alloys. Pt. I. The Equilibrium Diagram of Cr-Mo-Fe System.** S. Takeda and N. Yukawa. *Japan Institute of Metals, Journal,* v. 21, Apr. 1957, p. 275-279. (CMA)

Microscopy and thermal and X-ray analysis were used to study the Cr-Mo-Fe system. Six phases exist, including a hexagonal Fe_3Mo_2 phase, a tetragonal FeMo sigma phase, and a ternary compound phase ($Fe_{36}Mo_{10}Cr_{12}$). Three nonvariant reactions involving several phases and the melt are described.
(M24c; Cr, SGA-h)

280-M. (Russian.) **Fracture Method for Finding Steel Casting Defects.** K. I. Basov. *Liteinoe Proizvodstvo,* no. 1, Jan. 1957, p. 16-17.

Fracture method is supplementary to micrographic technique in determination of steel casting defects.
(M28h; ST, 5)

281-M. (Swedish.) **Crystallography and Metallography of Uranium.** Roland Kiessling. *Svensk Kemisk Tidskrift,* v. 68, no. 11, 1956, p. 581-587.

Historical survey of research; electron structure; spectrography of metals in the actinium group. Physical qualities of uranium (the coefficient of thermal expansion), and uranium alloys. 10 ref.
(M general, P11g; U)

282-M. (Book.) **Ore Microscopy. 2nd Ed.** Sigmund L. Smith. 278 p. 1957. Sturm & Smith, University Station, P.O. Box 4063, Tucson, Ariz. $10.

A text designed for the metallurgical, mining and geological engineer. Study of ores with various microscopes; methods for examination of fragments, polished specimens and thin section; correlation of minerals with geological deposits; sketches and charts. (M27; RM-n)

N Transformations and Resulting Structures

248-N. Influence of the Carbon-Silicon Ratio on Graphitization of Malleable Iron. Areil Taub and Ehud Avivi. *Foundry,* v. 85, July 1957, p. 101-103.

Experimental study of relationship between carbon-silicon ratio and time for decomposition of cementite into graphite and ferrite in chilled white iron bars. Effects of manganese and sulphur.
(N8s, 2-10; CI-p, CI-s)

249-N. Diffusion of Calcium and Silicon in a Lime-Alumina-Silica Slag. Helen Towers and John Chipman. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, June 1957, p. 769-773.

Investigates a capillary method and a rotating block method for the study of diffusion of calcium and silicon in slag. Capillary method using radioactive calcium-45 and silicon-31 is used for calculating diffusion coefficient values in a slag of 39% calicum oxide, 21% alumina, 40% silicon dioxide. 4 ref.
(N1a; Ca, Si, RM-q)

250-N. Preparation and Properties of Boron Treated Nonaging Open Hearth Steel. Eric R. Morgan and John C. Shyne. *Journal of Metals,* v. 9, *AIME Transactions,* v. 209, June 1957, p. 781-785.

Principles of strain aging and its elimination by boron additions. Interrelation following boron addition of bearing, rimming and capping techniques with boron content in ingots. 7 ref. (N7e; ST-e, *B*)

251-N. Effect of Alloying Elements on the Rate of Graphitization of White Cast Iron. M. A. Krishtal. *Metal Progress,* v. 72, July 1957, p. 136-137. (Digest from *Metallovedenie i Obrabotka Metallov,* no. 5, 1956, p. 17-18.)

Data on the effect of tungsten on graphitization of a 4% C, 1.2% Si cast iron show that under most conditions the rate of graphitization, v, is limited by diffusion in the iron matrix rather than by the diffusion of carbon atoms. (N8s, N1; CI-p)

252-N. Diffusion of Arsenic in Steel. D. S. Kazarnovskii. *Metal Progress,* v. 72, July 1957, p. 144. (Digest from *Doklady Akademii Nauk, S.S.S.R.,* v. 100, no. 6, 1955, p. 1073-1075.)

Previously abstracted from original. See item 207-N, 1955.
(N1, M27; ST, *As*)

253-N. Pearlitic Reaction in Alloy Steel. R. I. Entin. *Metal Progress,* v. 72, July 1957, p. 173-175. (Digest from *Metallovedenei i Obrabotka Metallov,* no. 9, 1956, p. 3-9; no. 10, 1956, p.20-28.)

Previously abstracted from original. See item 538-N, 1956.
(N8h, AY)

254-N. Characteristics of the Bond Interface Formed Between Zircaloy-2 and Uranium-12 w/o Molybdenum. H. A. Saller, S. J. Paprocki and E. S. Hodge. *U. S. Atomic Energy Commission, BMI-1048.* Oct. 17, 1955. 46 p. (CMA)

The bond interface formed by cladding was studied for high-temperature corrosion resistance. Various degrees of interdiffusion were obtained under the pressure bonding conditions. Corrosion resistance was greatest where interdiffusion was least. Extensively interdiffused samples failing by rupture in 630° F. water. The least resistant alloys were those with 12% Mo and zirconium replacing the uranium. Chromium, platinum and tantalum layers show the best resistance.
(N1h, L22, R general, 2-12; Zr, U)

255-N. The Transformation Kinetics of Uranium-Zirconium Alloys Containing 50 and 60 Wt Pct. Uranium. J. J. Kearns *U. S. Atomic Energy Commission,* WAPD-T-417, Nov. 21, 1956, 36 p. (CMA)

The isothermal transformation kinetics of the γ-phase of 50% Zr and 40% Zr uranium alloys were studied in the 200-580° C. range. Dilatometric, metallographic, X-ray diffraction and hardness data were obtained for quenching from γ-solution to the isothermal transformation temperature and to 25° C., followed by reheating. The ordered E-phase forms and grows above 500° C. very rapidly. The reaction starts rapidly at lower temperatures and the process resembles that at high temperatures, but the rate falls off. X-ray diffraction shows diffuse superlattice lines although the main lattice lines are sharp throughout transformation. When samples are quenched below the nose of the transformation curve, rippled microstructures are shown and a hardening reaction sets in. Dispersed E grains are believed to coalesce into subcells. Some alpha uranium precipitates in transformation.
(N7c, N10; U, Zr)

256-N. Magnesium-Zirconium Diffusion Studies. L. S. DeLuca, H. T. Sumsion and D. D. Van Horn. *U. S. Atomic Energy Commission,* KAPL-1746, Apr. 1, 1957, 31 p. (CMA)

The interdiffusion between magnesium and zirconium in the 500-540° C. range was studied metallographically. The layer formed is made up of as many as three separate zones. The first is formed by the grain-boundary diffusion of magnesium into zirconium, and was observed at all temperatures. The activation energy for the process is 18,300 cal. per gram-atom for zone 1 alone and 34,200 cal. per gram-atom with either zone 2 or 3. Vapor transport is important in zone 1 formation. Zones 2 and 3 are formed by zirconium diffusion into magnesium in different solute concentrations, and the formation rate is insignificant below 600° C. 8 ref.
(N1e; Mg, Zr)

257-N. (French.) **Study of Isothermal Transformations of Iron With Cu-Cr and Ni-Cr Containing Approximately 0.5% Mo.** Albert de Sy and J. Van Eeghem. *Fonderie Belge,* no. 5, May 1957, p. 92-105.

Presents TTT-diagrams for seven types of cast iron and discusses influence of molybdenum, copper, nickel and chromium on the transformation curves. The structures in the raw state of casting are compared with the TTT-diagrams, and it is shown that there is an excellent correlation. Micrographs illustrate various structures obtained.
(N8g, 2-10; CI-q, *Mo*)

258-N. (French.) **Action of Some Pure Gases and Their Mixtures on the Surface (0001) of Pure Zinc.** L. Cavallaro and G. P. Bolognesi. *Journal de Chimie et de Physico-Chimie Biologique,* v. 54, Jan. 1957, p. 63-71.

Study of action of O_2, SO_2, N_2, CO_2, SO_2-N_2 and O_2-SO_2 on freshly split surface of pure zinc. 40 ref.
(N15d; Zn)

259-N. (German.) **Precipitation Hardening Process From the Thermodynamic Point of View.** Ulrich Dehlinger and Hermann Franz. *Zeitschrift Für Metallkunde,* v. 48, Apr. 1957, p. 176-180.

Precipitation occurs below the spinodal in a single process by negative diffusion followed by a rearrangement of the segregated domains. The phases of theta-prime and theta nucleate dislocations by reactions of the first order. Such a nucleation has to be assumed, in the formation of regular eutectoid structure, like pearlite. 21 ref.
(N7b, N2g)

260-N. (Japanese.) **Study on Carbides in Structural Steels by Electrolytic Isolation. Pt. 3.** Tomo-o Sato, Taiji Nishizawa and Masaaki Ohashi. *Iron and Steel Institute of Japan, Journal,* v. 43, Apr. 1957, p. 485-489.

Electrolytic isolation studies were carried out on carbides in Ni-Cr, Cr-Mo and Si-Mn structural steels. Concentrations of special elements in carbides in these steels, tempered at about 400° C., are similar to the contents of each element in the steels. At above 500° C., the carbides are enriched in Cr, Mn and Mo, while impoverished in Si and Ni. The rate of enrichment of Mo in carbides is exceedingly slow, as compared with that of Cr and Mn. The rate of enrichment of Cr and Mn in carbides is retarded by the coexistence of Mo in the steel. 5 ref.
(N8r, 2-10, M23; AY, *Ni, Cr, Mo, Mn*)

261-N. (Russian.) **Growth of Grains of Commercial Titanium During Heating.** L. N. Sokolov. *Metallovedenie i Obrabotka Metallov,* no. 10, Oct. 1956, p. 34-36. (CMA)

The size of titanium grains in previously deformed samples was measured as a function of temperature and time of heating. In the interval 800-1100° C. the size increases with the temperature, and for a given temperature the grains grow with time until the point is reached when this growth is arrested as a result of the precipitation of impurities. In commercial titanium containing 0.5% C the grain remains comparatively small up to 1100° C.; this may be due, among other causes, to the presence of a carbide phase. 3 ref.
(N3, 2-11; Ti)

262-N. Effects of Plastic Deformation on Carbide Precipitation in Steel. D. V. Wilson. *Acta Metallurgica,* v. 5, June 1957, p. 293-302.

Carbon steels containing 0.47, 0.74 and 0.88% carbon were studied. Cold work restrains precipitation in quenched steels. If a steel is first tempered to precipitate an iron carbide and then deformed, the precipitate will tend to redissolve in the cold worked matrix. 20 ref.
(N7b, 3-18; CN)

263-N. Precipitation in Gold-Platinum Alloys. T. J. Tiedema, J. Bouman and W. G. Burgers. *Acta Metallurgica,* v. 5, June 1957, p. 310-321.

Experiments and theories on precipitation stage characterized by "side bands". Determination of two phase boundary by means of Debye-Scherrer photographs. 22 ref.
(N7b; Au, Pt)

264-N. Strain Aging of Boron-Treated Low-Carbon Steels. E. R. Morgan and J. C. Shyne. *Iron and Steel,* v. 30, June 1957, p. 269-271.

Two series of alloys were tested. Aging index was markedly reduced by addition of boron. Maximum effect occurred in range 0.007-0.025% boron. Also showed carbide increase without producing a precipitate of iron boride and had no effect on grain size. (N7e; CN, *B*)

265-N. Physical Metallurgy of Low-Carbon, Low-Alloy Boron Steels. K. J. Irvine, F. B. Pickering, W. C. Heselwood and M. Atkins. *Iron and Steel,* v. 30, June 1957, p. 272-280.

Transformation characteristics were examined isothermally and on continuous cooling. Effects of molybdenum, tungsten, manganese and carbon on transformation also required. (N8g, 2-10; AY, *B*)

266-N. Calculation of Diffusion Coefficients by the Matano-Boltzmann Method. E. M. Baroody. *Journal of Metals,* v. 9; *AIME Transactions,* v. 209, July 1957, Sec. 2, p. 819-822.

New way of applying method is derived and illustrated. Curve obtained, when concentration is plotted against position on probability paper, is approximated by a polynomial, and diffusion coefficient calculated from an equation in which the coefficients of the polynomial appear as parameters. 8 ref. (N1b)

267-N. Some Aspects of Alloying Onto Germanium Surfaces. J. W. Peterson, J. McGlasson, Jr., and W. C. Hittinger. *Journal of Metals,* v. 9; *AIME Transactions,* v. 209, Sec. 2, July 1957, p. 823-827.

Layers of n-type with thickness in range of 0.0002 in. over areas of 0.006 sq. in. were produced on intrinsic germanium wafers by an alloy regrowth process as one stage in the fabrication of transistors. In process now in use, lead is the solvent and antimony the doping impurity. 8 ref.
(N12, T1k, 17-7; Ge, *Sb*, 9-1)

268-N. Cube Texture in Copper. Y. C. Liu. *Journal of Metals,* v. 9; *AIME Transactions,* v. 209, July 1957, Sec. 2, p. 836-842.

Copper single crystals of $(3\bar{5}8)$ $[\bar{5}23]$ initial orientation retain their orientation up to 95% reduction in thickness. In deformed matrix of same orientation, occurrence of recrystallization texture depends on both annealing temperature and rolling reduction. 14 ref.
(N5; Cu, 14-11)

269-N. Grain Growth in Dilute Alloys of Copper. S. Weinig and E. S. Machlin. *Journal of Metals,* v. 9; *AIME Transactions,* v. 209, July 1957, Sec. 2, p. 843-845.

Grain growth law $D = kt^n$ was found to describe data for dilute binary alloys of copper satisfactorily. Activation energies for grain migration compare well with values obtained from internal friction studies on identical alloys. 7 ref.
(N1m; Cu)

270-N. Concerning an Order-Disorder Transition in the Ni-Cr System. B. W. Roberts and R. A. Swalin. *Journal of Metals,* v. 9; *AIME Transactions,* v. 209, July 1957, Sec. 2, p. 845-846.

Results of neutron diffraction investigation coupled with a dilatometric investigation. 8 ref.
(N10, M24b; Ni, Cr)

271-N. Preferred Growth Direction of Metals. William A. Tiller. *Journal of Metals,* v. 9; *AIME Transactions,* v. 209, July 1957, Sec. 2, p. 847-855.

For face-centered cubic metals, preferred orientation formed during solidification of columnar zone of an ingot is: (1) the [111] direction for pure metals, (2) no preferred direction for slightly impure metals, (3) the [100] direction for impure metals and alloys. Direction of formation of boundaries between substructures and occurrence of stray crystal formation a function of orientation of solid-liquid interface and degree of constitutional supercooling. 15 ref. (N5g, N12)

272-N. Nucleation Sites of Bainitic Carbides in Alloy Steels. S. M. Kaufman, G. M. Pound and H. I. Aaronson. *Journal of Metals,* v. 9; *AIME Transactions,* v. 209, July 1957, Sec. 2, p. 855-856.

Effects of alloying elements on the nucleation sites selected by bainitic carbides. It is concluded that the carbides can nucleate both in austenite and in ferrite. 9 ref.
(N2, N8r, 2-10; AY)

273-N. Aging in Complex Commercial Ni-Cr Alloys Hardened With Titanium and Aluminum. R. F. Wilde and N. J. Grant. *Journal of Metals,* v. 9; *AIME Transactions,* v. 209, July 1957, p. 865-872. (CMA)

Air-melted Inconel X 550, Inco 700, and vacuum-melted M-252 and Waspaloy (all hardened with titanium and aluminum) were studied in detail for the aging response. The γ' phase Ni_3 (Al, Ti) was identified in all but M-252; the latter has a matrix parameter larger than that

of γ' because of the high molybdenum content. Carbide is shown to precipitate in M-252. Air cooling of thin sections fails to maintain all the aluminum and titanium in solution except possibly in Inconel X 550 cooled from 1900° F. (but not from 2200° F.).
(N7a; Ni, Cr, SGA-h, *Ti*, *Al*)

274-N. Diffusion in Gold and Au-Ag Alloys. H. W. Mead and C. E. Birchenall. *Journal of Metals*, v. 9; *AIME Transactions*, v. 209, July 1957, Sec. 2, p. 874-877.

Self-diffusion coefficients of gold in pure gold and alloys of gold and silver measured over a range of temperatures. Results compared with earlier work and internally on basis of Darken's equations. 18 ref.
(N1d; Au, *Ag*)

275-N. Preparation of Alpha Uranium Single Crystals by a Grain-Coarsening Method. E. S. Fisher. *Journal of Metals*, v. 9; *AIME Transactions*, v. 209, July 1957, Sec. 2, p. 882-888.

Factors influencing grain growth, size of coarse grains in uranium and preparation of single crystals of round cross section are discussed. 6 ref. (N3r; U)

276-N. Hydrogen Distribution in Heat Treated Titanium as Established by Autoradiography. O. J. Huber, et al. *Journal of Metals*, v. 9; *AIME Transactions*, v. 209, July 1957, p. 918-923. (CMA)

A dark-etching phase is often introduced at the grain boundaries of beta-titanium alloys on duplex heat treatment. This has been observed in Ti-5Mn-2.5Cr, Ti-3.5Cr-3.5V, Ti-8Mn and Ti-3Mn complex. The latter was studied by autoradiography, using tritium as a tracer, and by electron microscopy. The phase is shown to be hydrogen-rich and appears where the ratio of alpha to beta is relatively high. The duplex heat treatment involved isothermal annealing in the 800-1100° F. range. (N15d, M23q; Ti)

277-N. Blister Formation in Rolled Aluminum. J. H. O'Dette. *Journal of Metals*, v. 9; *AIME Tranactions*, v. 209, July 1957, Sec. 2, p. 924-929.

Study of the more commonly used methods of removing hydrogen from aluminum, location of discontinuities, study of movement of gas in the metal and effect on blistering, development of methods of blister control during fabrication. 6 ref.
(N15e, F23; Al, 9-21)

278-N. Diffusion of Magnesium, Silicon, and Molybdenum in Nickel. R. A. Swalin, Allan Martin and R. Olson. *Journal of Metals*, v. 9; *AIME Transactions*, v. 209, July 1957, Sec. 2, p. 936-939.

Diffusion rates were measured as a function of temperature. Activation energies obtained were close to that for self-diffusion in nickel with the exception of magnesium. 7 ref.
(N1e; Ni, *Mg*, *Si*, *Mo*)

279-N. Diffusion Characteristics of Thorium and Aluminum. J. A. Milko. Oak Ridge National Laboratory. *U. S. Atomic Energy Commission*, ORNL-1774, Dec. 30, 1954, 35 p.

Investigation to develop information on the construction of assemblies for a converter type of reactor utilizing aluminum-clad thorium plates. Extent of the diffusion was evaluated by a measurement of the thickness of the resulting diffusion layer formed between these two metals, in intimate contact, in vacuum. An appreciable amount of diffusion was observed between thorium and aluminum, particularly in the temperature range of 500 to 600° C. Barriers of aluminum-silicon alloys were not effective in minimizing the diffusion. (N1h; Th, Al)

280-N. Investigation of Uranium Solid Solubility in Thorium. Arthur A. Bauer, Frank A. Rough and Ronald F. Dickerson. Battelle Memorial Institute. *U. S. Atomic Energy Commission*, BMI-1188, May 29, 1957, 10 p.

Metallographic, hardness, X-ray diffraction and electrical-resistivity data. On the basis of electrical resistivity and X-ray diffraction data, solubility of uranium in thorium lies between 1.5 and 2% uranium at 1000° C. and between 0.5 and 1% uranium at 800 and 900° C. At temperatures below 800° C., solubility is less than 1% uranium.
(N12p; U, Th)

281-N. Diffusion of Oxygen in Zirconium and Its Relation to Oxidation and Corrosion. J. P. Pemsler. *U. S. Atomic Energy Commission*, NMI-1177, May 31, 1957, 49 p. (CMA)

Oxygen diffusion into zirconium and dilute zirconium alloys was studied in the 400-585° C. range by observing the dissolution rates of anodically deposited interference oxide films. The diffusion coeficient is at a minimum when the c-axis parallels the plane of diffusion, and at a maximum when they are at a 20° angle; at higher angles the values are intermediate.
(N1b, R1h; Zr, *O*)

282-N. Germinative Grain Growth Characteristics of Zirconium. J. C. Bohros. *U. S. Atomic Energy Commission*, NAA-SR-1926, June 15, 1957, 26 p. (CMA)

Above 950° F., zirconium, which has been strained beyond a critical point, will show germinative grain growth during recrystallization. This can reduce fatigue life by a factor of 2 to 9 at both high and low temperatures. A study of recrystallized grain size vs. plastic strain and annealing temperature showed that germinative grain growth may be avoided by a temperature limitation on inhomogeneously deformed zirconium and Zircaloy-3. Zircaloy-2 shows no germinative grain growth up to 1200° F.
(N3, N5; Zr)

283-N. Self-Diffusion and Interdiffusion in Gold-Nickel Alloys. J. E. Reynolds, B. L. Averbach and M. Cohen. Massachusetts Institute of Technology (Wright Air Development Center.) *U. S. Office of Technical Services*, PB 121457, Mar. 1956, 36 p. $1.

Measurements were taken on the self-diffusion and interdiffusion coefficients in gold-nickel alloys as a function of composition and temperature. The data were combined with the thermodynamic properties of the gold-nickel system to test the validity of the Darken equation for the quantitative relationships between the intrinsic and interdiffusion coefficients. The relationship was found to hold within the experimental accuracy of the measurements. (N1d, N1e; Au, Ni)

284-N. Anisotropy of the Rate of Crystal Growth. F. P. Rybalko. *Fizika Metallov i Metallovedenie*, v. 3, 1956, p. 184-185. *(Henry Brutcher Translation* no. 3942).

Phenomena contradicting the "law" of crystallization according to which the ratio among the rates of growth of individual crystal faces remains constant regardless of changes in the conditions of crystallization. (N12)

285-N. Problem of Graphitization of Low-Carbon Steel. I. V. Salli and I. I. Pyasetskii. *Fizika Metallov i Metallovedenie*, v. 13, 1956, p. 513-515. (*Henry Brutcher Translation* no. 3952).

Mechanism of graphization with special reference to processes occurring during heat treatment in vacuum. Effect of cooling rate upon precipitation of graphite on specimen surface. Interpretation of results with the aid of the ferrite-graphite equilibrium curve in the iron-carbon phase diagram; causes of graphitization of low-carbon steel.
(N8s; CN)

286-N. Kinetics of Change in Microstructure of Metals and Alloys During Creep, Involving High-Temperature Heating Under Tension and Vacuum. M. G. Lozinskii and E. I. Antipova. *Metallovedenie i Obrabotka Metallov*, v. 1, 1955, p. 9-14. (*Henry Brutcher Translation* no. 3965).

Previously abstracted from original. See item 118-N, 1956.
(N8, N5, Q3, Ay, Cu, Ni)

287-N. Grain Growth of Technical Titanium on Heating. L. N. Sokolov. *Metallovedenie i Obrabotka Metallov*. v. 2, 1956, p. 34-36. (*Henry Brutcher Translation* no. 3856).

Effect of duration and temperature of heating in range of from 700 to 1100° C. of previously deformed technical titanium (containing 0.5% carbon) upon its grain growth. Typical microstructures obtained after various heat treatments; limited effect of duration of heating; reason for the fine grain in 0.5% C. technical titanium on heating to 1100° C. (N3, 2-14; Ti)

288-N. Sigma Phase in 25-20 Steel Welds. B. I. Medovar. *Metallovedenie i Obrabotka Metallov*, no. 3, Mar. 1957, p. 27-30. (*Henry Brutcher Translation* no. 3954).

Investigation of conditions under which sigma phase is formed in a 0.12% C., 1.1% Mn, 23% Cr, 18⅓% Ni steel (automatic welding, ½-in. gage). Procedure based on impact tests, micrographic analysis, and X-ray study of isolated precipitates. Effect of strain hardening on sigma formation. Danger of gamma-to-sigma transformation. Steps recommended for suppression to sigma in weldments of 25-20 steel.
(N8, K9r; SS)

289-N. (German.) **Calorimetric Investigations Into Kinetics of the Isothermal Decomposition of Austenite in Steels Containing 12% Manganese.** Gaston Collette. *Archiv für das Eisenhüttenwesen*, v. 28, Apr. 1957, p. 229-235.

Experiments with cast and cold rolled hard manganese steel at temperatures of 200 to 500° C.; interpretation of heat generation; kinetics of platelike carbide separation within the grain; relationship between time of the greatest heat generation and the experimental temperature; calculation of the time at which the first platelike separations can be seen with a microscope.
(N8; AY, *Mn*)

290-N. (Polish.) **An Attempt at Mathematical Interpretation of Relationship Between Limited Solubility and Temperature.** Z. Jasiewica and J. Janus. *Hutnik,* v. 24, Apr. 1957, p. 138-142.

Computation of limiting solubility curve from free energy change; graphic solutions for alloys of Cu-Ag and Al, Mg-Al and Zn; Fe-P, Ti, Sn, Mo, W; and Pb-Sn; comparison of experimental results with computation. (N12p, P12a)

Physical Properties

285-P. Low Temperature Resistivity of the Transition Elements: Cobalt, Tungsten, and Rhenium. G. K. White and S. B. Woods. *Canadian Journal of Physics,* v. 35, May 1957, p. 656-665.

Experimental values are reported for the electrical resistivity from 1.5 to 300° K., and for the thermal resistivity from 2 to 120° K., of high-purity cobalt, tungsten and rhenium. The temperature variation of the components of the electrical and of the thermal resistance due to scattering by thermal vibrations is deduced and the possible evidence for the importance of s-d transitions is discussed briefly. The temperature of the superconducting transition in samples of rhenium is found to be close to 1.70° K. 35 ref. (P15g; Co-a, W-a, Re-a)

286-P. Specific Heats of Some Metallic Elements. Pt. 4. The Residual Spectrum. C. V. Raman. *Indian Academy of Sciences. Proceedings,* v. 45, Mar. 1957, p. 139-146.

Theoretical calculation of the specific heats of aluminum, copper, silver and lead with temperature in the vicinity of absolute zero. Calculated specific heats are in satisfactory accord with experimental results. 9 ref. (P12r; Al, Cu, Ag, Pb)

287-P. Thermodynamics of the Zr-ZrO_2 System: The Dissociation Energies of ZrO and ZrO_2. W. A. Chupka, J. Berkowitz and M. G. Inghram. *Journal of Chemical Physics,* v. 26, May 1957, p. 1207-1210. (CMA)

The mass spectrometry of zirconium and/or ZrO_2 vapors was used to determine the vapor pressures, and hence the heats of sublimation. These data are tabulated and yield 7.8 ev and 14.5 ev for the dissociation energies of ZrO and ZrO_2, respectively. (P12q, P12c; Zr)

288-P. Relationship Between the Surface Tension of Liquid Chromium-Nickel Alloys and Some Properties in the Solid State. O. S. Bobzova and A. M. Samarin. *Metal Progress,* v. 72, July 1957, p. 178-182. (Digest from *Isvestiya Akademii Nauk S.S.S.R.,* No. 2, Feb. 1954, p. 52-59.)

Previously abstracted from original. See item 549-P. 1954. (P13k, Q29, Q6; Cr, Ni)

289-P. Electrical Properties of Thin Metal Films. Jacob Riseman. *New York Academy of Sciences, Transactions,* v. 19, Apr. 1957, p. 503-514.

Chromium films were prepared by the vacuum evaporation method. Initial results could be represented by a curve in which the average temperature coefficient of resistance, between 25 and 105° C., varied continuously with the electrical resistance. The temperature coefficient varied from about + 150 x 10^{-6} per ° C. to − 400 x 10^{-6} per ° C. over the resistance range of 100 to 2000 ohms per sq. mm. 14 ref. (P15g; Cr, 14-12)

290-P. On the Surface Free Energy and Specific Heat of a Metal. R. Stratton. *Philosophical Magazine,* v. 2, May 1957, p. 702-704.

Calculations on the surface contributions to the lattice and free electron specific heats of metals. (P12r, P12a)

291-P. Magnetic Saturation in Alloys of Neodymium at Low Temperatures. J. M. Lock. *Philosophical Magazine,* v. 2, June 1957, p. 726-732. (CMA)

Magnetization of Nd-La alloys measured. Above 15° K. the susceptibility is field dependent and obeys the Curie-Weiss law. Saturation effects are shown at lower temperatures. A model is proposed on the basis of ferromagnetic and antiferromagnetic behavior. (P16, 2-13; Nd, *La*)

292-P. Specific Heats and Magnetic Susceptibilities of Alloys of Cerium With Lanthanum at Low Temperatures. L. M. Roberts and J. M. Lock. *Philosophical Magazine,* v. 2, June 1957, p. 811-819. (CMA)

Specific heat measurement of Ce-La alloys in the 1.5-20° K. range and magnetic susceptibility measurements in the 1.5-290° K. range are reported. The specific heat of cerium shows a single anomaly at 12.3° K. which splits into two for the alloys. The movements of these anomalies on the temperature scale with changes in composition are described. Antiferromagnetism is considered as an explanation. (P12r, P16; Ce, La)

293-P. Magnetic Properties of Neodymium Single Crystals. D. R. Behrendt, S. Legvold and F. H. Speeding. *Physical Review,* v. 106, May 15, 1957, p. 723-725. (CMA)

Single crystals of neodymium were measured magnetically at 20.4° K. and higher. The susceptibility is higher when the field is perpendicular to the c axis rather than parallel. No anisotropy was observed at the basal plane here, but at 4.2° K. magnetic anisotropy was observed and anti-ferromagnetic ordering is indicated. (P16; Nd, 14-11)

294-P. Theory of a New Apparatus for Determining the Thermal Conductivities of Metals. S. T. Hsu. *Review of Scientific Instruments,* v. 28, May 1957, p. 333-336.

The principle of transient temperatures inside a semi-infinite solid is applied to two identical sets of composite plates. Each of these sets consists of a standard specimen of a certain metal whose properties are known and a test specimen of a metal whose thermal diffusivity is to be determined. When these two sets, initially at different but constant temperatures, are brought into contact with each other, the transient temperature at the contact plane between the test and standard specimens corresponding to a certain time is measured, then the coefficient of thermal diffusivity of the tests specimen can be computed. (P11h, P11m, 1-3)

295-P. Reduction of Irradiation Damage to Uranium by Small Zirconium Additions. Interim Report. S. Untermyer. *U. S. Atomic Energy Commission,* ANL-4604, Mar. 27, 1951, 5 p. (CMA)

The presence of some alloy additions reduces the irradiation damage to uranium in thermal reactors, but such diluents are not permissible in fast breeders or natural uranium reactors. The effects of small additions of zirconium were investigated (up to 10%) since it scatters fast neutrons well. Zirconium foils were tightly welded to U^{238} and U^{235} wafers; only slight irradiation damage was shown. The unprotected U^{235} control sample showed heavy pimpling. (P18, W11p, 17-7, 2-17; U, *Zr*)

296-P. Effects of Postirradiation Annealing of Uranium-Zirconium Alloys. W. W. Johnston. *U. S. Atomic Energy Commission,* KAPL-1562. May 5, 1956. 19 p. (CMA)

Specimens of an 8% enriched U-Zr alloy which had been irradiated to the maximum were vacuum annealed at 425, 510 and 595° C. Densities and the amount of Zr^{85} released were determined as a function of time and temperature up to 500 hr. Specimens were all stable at 425° C. but volume increases of 15% were obtained at 595°C. The time dependence of gas release differed among various temperatures. 7 ref. (P10a, J23, 1-23, 2-17; U, *Zr*)

297-P. (English.) **Magneto-Resistance at Low Temperatures and the Mean Free Path in Metals.** D. K. C. MacDonald. *Bulletin de l'Institut International Du Froid* (International Institute of Refrigeration), Supplement, Annexe 1956-2, Sept. 1956, p. 15-21.

The application of a magnetic field to a metal at constant temperature produces two well known effects when an electric current is passed through the metal. An electric field is generated (the Hall field) whose direction is perpendicular to the plane containing the applied magnetic field and the electric current, and secondly the resistance of the metal is found to increase (magneto-resistance effect). Essentially, the role played by the Hall field is to tend to balance the Lorentz force of the magnetic field acting on the moving charge-carriers and thus to tend to restore the unperturbed direction of current flow. (P16b, 2-13)

298-P. (English.) **Electrical Resistance and the Purity of Metals.** G. J. van den Berg. *Bulletin de l'Institut International Du Froid* (International Institute of Refrigeration) Supplement, Annexe 1956-2, Sept. 1956, p. 31-37.

From the results of measurements it is concluded that an absolute purity scale of metals cannot be based on the measurements of the residual resistance of single crystals and polycrystalline wires. 28 ref. (P15g, 14-11)

299-P. (English.) **Peculiarities of the Temperature Dependence of the Electrical Resistance of Ferromagnetic Metals at Low Temperatures.** A. I. Sudovtsov and E. E. Semenenko. *Soviet Physics JETP,* v. 4, May 1957, p. 592-593. (Translated by American Institute of Physics.)

Peculiarity is brought about by the collisions of the conduction electrons with the carriers of ferromagnetism. Measurements were carried out on polycrystalline samples of iron, nickel and platinum in the temperature interval from 4.2 to 1.23° K. Platinum was chosen for comparison of the ferromagnetic metals with a

metal of the transition group that was nonferromagnetic.
(P15g, 2-13; Fe, Ni, Pt)

300-P. (French.) **Properties of Pure Aluminum.** G. Chaudron. *Bulletin de l'Institut International Du Froid* (International Institute of Refrigeration) Supplement, Annexe 1956-2, Sept. 1956, p. 39-40.

The measurement of electric conductivity at low temperatures was particularly useful for following the purification of aluminum by the zone melting method. The measurement of residual resistance at liquid helium temperatures is a purity criterion when the metal is perfectly recrystallized. The electric conductivity method at low temperatures enables a thorough study of the recrystallization of aluminum starting from the cold worked state. It is also possible to study the imperfections of metals by this method. (P15g, N5, 2-13; Al-a)

301-P. (French.) **Influence of the Recrystallization of Aluminum on the Electrical Conductivity at Low Temperatures.** P. N. Albert. *Bulletin de l'Institut International Du Froid* (International Institute of Refrigeration), Supplement, Annexe 1956-2, Sept. 1956, p. 41-49.

New aluminum obtained by the zone refining method provides clear evidence of recrystallization at low temperatures. Aluminum studied had a purity degree of 99.999% at temperatures between 50° C. and room temperature. The electrical conductivity at low temperatures is a very sensitive method for following the evolution of the structure of a metal. 5 ref.
(P15g, N5, 2-12; Al-a)

302-P. (French.) **Measurements on the Electrical Conductivity at Low Temperatures of Very Pure Aluminum Samples.** M. Caron. *Bulletin de l'Institut International Du Froid* (International Institute of Refrigeration) Supplement, Annexe 1956-2, Sept. 1956, p. 51-62.

Studies the relationship between electrical resistivity at low temperatures and the degree of purity of aluminum samples refined by the molten zone refining method and perfectly recrystallized by prolonged annealing. 6 ref. (P15g, 2-13; Al-a)

303-P. (French.) **Study of the Elimination of Lacunae in Very Pure Aluminum.** M. Wintenberger. *Bulletin de l'Institut International Du Froid* (International Institute of Refrigeration) Supplement, Annexe 1956-2, Sept. 1956, p. 71-75.

At the boiling point of liquid hydrogen (20.4° K. at 760 mm.) the electrical resistivity of aluminum is very sensitive to the presence of physical imperfections in the lattice of the metal. The elimination of lacunae at room temperature by following the evolution of electrical resistivity at 24.4 was studied. Two processes were used to introduce the lacunae in the metal lattice; tempering starting from temperatures near the melting point and plastic deformation. (P15q, M26, 2-13; Al-a)

304-P. (French.) **Changes in Magnetization of Nickel Caused by Adsorbed Films.** J. J. Broeder, L. L. Van Reijen and A. R. Korwagen. *Journal de Chimie Physique,* v. 54, Jan. 1957, p. 37-44.

Adsorption of hydrogen, ethylene and acetylene causes the magnetic moment of nickel to decrease. No effect was noted for nitrogen, while oxygen decreases the magnetic moment. 13 ref. (P16; Ni)

305-P. (French.) **Optical and Electrical Study of Bismuth Tellaride, Bi_2Te_3.** J. Lagrenaudie. *Journal de Physique et le Radium,* Supplement to No. 3, v. 18, Mar. 1957, p. 39A-40A.

Bismuth telluride is prepared by comelting components and refining by zone melting process. 10 ref.
(P15, P17, C28k; Bi, Te)

306-P. (Japanese.) **Aluminum and Aluminum Alloys for Electrical Conductors.** Kenkich Kamagi. *Metals,* v. 27, June 1957, p. 443-448.

Comparison of electric conductivity, tensile strength, thermal conductivity, melting point and elongation of aluminum wire, hard copper wire, copper wire and silmalec wire. Relation of electric conductivity of aluminum wire to its impurities; applications of aluminum wire. 36 ref.
(P15g, P11h, P12n, Q27a; Al, SGA-r)

307-P. (Japanese.) **Aluminum Foil and Its Applications.** Namio Kawashima. *Metals,* v. 27, June 1957, p. 454-458.

Physical, chemical and mechanical properties of aluminum foil at different thicknesses (0.0005 to 0.005 in.) Methods of manufacture and applications.
(P general, Q general, 17-7; Al, 4-6)

308-P. **Performance of Magnetostrictive Transducers Made of Aluminum-Iron Alloy or Nickel-Copper Ferrite.** Yoshimitsu Kikuchi. *Acoustical Society of America, Journal,* v. 29, May 1957, p. 569-573.

Specifications for the melting and rolling processes; factors affecting the magnetostriction characteristics; improvement of transduction efficiency. It is concluded that no other material which has larger coupling factor than that of nickel or "Alfer" (the 13.5% Al-Fe alloy), is necessary, insofar as the transducers to be used at their resonance are concerned. Improvement in the efficiency can be attained only by the considerable elimination of the eddy current, and this is accomplished by several magnetostrictive transducers made of Ni-Cu ferrites which are shown to be excellent for generating underwater ultrasound.
(P10; Al, Ni, Cu)

309-P. **Electrical and Thermal Conductivity of Some Brasses at Low Temperatures.** W. R. G. Kemp, P. G. Klemens, R. J. Tainsh and G. K. White. *Acta Metallurgica,* v. 5, June 1957, p. 303-309.

Copper-zinc alloys with up to 30% Zn were measured over wide range of temperatures and the lattice component of thermal conductivity deduced. Lattice conductivity at all temperatures was markedly increased by annealing. 19 ref.
(P11h, P15g, 2-13; Cu-n)

310-P. **Thermal Changes in Steels as Shown by Resistivity.** G. Bullock. *Iron and Steel,* v. 30, June 1957, p. 280-283.

Experimental method for obtaining precise resistivity values. Numerical consistency of results obtained is commensurate with performance factors of the apparatus. Method is tedious and involves intricate apparatus compared with common inverse rate thermal techniques. (P11, P15g, 1-3)

311-P. **Specific Heat and Resistivity of Mild Steel.** P. R. Pallister. *Iron and Steel,* v. 30, June 1957, p. 290-294.

Measurements were made from ordinary temperatures up to 1000° C. by the "spot" method. Electrical resistivity entered incidentally into the calculation of specific heat.
(P12r, P15g; CN)

312-P. **Electrical Resistivities and Phase Transformations of Lanthanum, Cerium, Praseodymium, and Neodymium.** F. H. Spedding, A. H. Daane and K. W. Herrmann. *Journal of Metals,* v. 9, July 1957, p. 895-897. (CMA)

The observed transformation points were confirmed by X-ray diffraction. Discrepancies between the heating and cooling curves of cerium are due to temperature fluctuations during the cooling measurements. (P15g, N6p; La, Ce, Pr, Nd)

313-P. **p-n Junctions in Silicon and Germanium: Principles, Metallurgy, and Applications.** G. C. Dacey and C. D. Thurmond. *Metallurgical Reviews,* v. 2, no. 6, 1957, p. 157-193.

Principles of electronic behavior of semiconductors, the importance of impurity distribution and p-n junctions and their applications as diodes and transistors; discusses phases giving phase diagram and distribution coefficients whereby impurities acting as donors and acceptors may be introduced into germanium and silicon crystals from liquid phase by freezing or by diffusion. Techniques for the controlled distribution of impurities by freezing and diffusion are reviewed in detail. 89 ref. (P15; Ge, Si, 9-1)

314-P. **Thermal and Electrical Conductivity of Chromium at Low Temperatures.** A. F. A. Harper, W. R. G. Kemp, P. G. Klemens, R. J. Tainsh and G. K. White. *Philosophical Magazine,* v. 2, May 1957, p. 577-583.

Electrical and thermal conductivities have been measured over a wide range of temperature of specimens of pure chromium, both in the ductile and embrittled states. It has been found that the low-temperature conduction properties are very similar to those of other transition metals investigated. At low temperatures the electrical resistance is mainly due to the scattering of electrons from the s-band to the d-band while (s-s) scattering contributes about 60% of the thermal resistance. 15 ref. (P11h, P15g, 2-13; Cr-a)

315-P. **Magnetization of Cobalt-Manganese and Cobalt-Chromium Alloys.** J. Crangle. *Philosophical Magazine,* v. 2, May 1957, p. 659-668.

Magnetization measurements on the hexagonal and the face-centered cubic phases in several ferromagnetic cobalt-rich alloys in these systems have been made. By the use of suitable extrapolation procedures, the magnetic moments of both phases in each system at the absolute zero have been estimated. In the cobalt-manganese alloys there is a significant difference in the dependence of moment on composition between the two phases. This is not the case in the cobalt-chromium alloys, where the rate of change of moment with composition of both phases is the same. 8 ref.
(P16; Co, *Mn, Cr*)

316-P. **Anodic Overpotential for Oxide-Free Zirconium.** M. Maraghini, G. B. Adams, Jr., and P. Van Rysselberghe. *U. S. Atomic Energy Commission,* AECU-3467, May 1, 1957, 12 p. (CMA)

An application of the method of

estimating oxide film thickness on zirconium from potential measurements is described, namely the estimation of the potential that a polarized zirconium anode would show if it were free of oxide film. The equations basic to the theory are expressed; experimental results are described. (P15, 1-3, R1-h; Zr)

317-P. Thermal Conductivity of 347 Stainless Steel and Zirconium. L. R. Vianey. Massachusetts Institute of Technology, N5 ori-07827, NR 035-267, *U. S. Office of Technical Services,* PB 123-175, Feb. 1951, 6 p. (CMA)

Thermal properties of zirconium and of stainless 347. (P11h; SS, Zr)

318-P. X-Ray Emission Spectra of Mn and Cu in a Heusler Alloy at Temperatures Around the Curie Point. E. E. Vainshtein and B. I. Kotliar. *Soviet Physics "Doklady",* v. 1, no. 5, p. 527-529. (Translated by American Institute of Physics Inc.)

Effect of the magnetic state of a substance on the X-ray spectra of its constituent elements. The shape and position of the lines of the K_β group of manganese and copper in an alloy which was close in composition to Cu_2Mn-Al and the corresponding characteristics of the $K\alpha_{1,2}$ lines of the same elements in a broad temperature range were investigated. 9 ref. (P17e, P16d; Mn, Cu)

319-P. Magnetoresistance and Hole Conduction in Tellurium. S. S. Shalyt. *Soviet Physics "Doklady",* v. 1, no. 4, p. 488-489. (Translated by American Institute of Physics, Inc.)

An investigation of magnetoresistance in tellurium at the temperature of liquid helium ($T \leq 4.2°$ K.) shows that the valence band of tellurium is split into two energy bands of different widths; in terms of the theory of electrical conductivity of solids this indicates that tellurium contains two groups of hole carriers of different mobility. (P15g, P16e; Te)

320-P. (English.) **Thermal Conduction and Heat Capacity of Dilute Silver Alloys at Low Temperatures.** J. De Nobel. *Bulletin de l'Institut International Du Froid* (International, Institute of Refrigeration), Supplement, Annexe 1956-2, Sept. 1956.

Results of measurements of the thermal conduction of dilute silver alloys (with 0.14, 0.32 and 0.55% manganese and 0.24% indium) carried out in intense magnetic fields up to 25 Ko are reported. 27 ref. (P11h, P12r, 2-13; Ag)

321-P. (English.) **Electrical Resistivity and Hall Coefficient of PbTe Crystals.** Kisaburo Shogenji and Susumu Uchiyama. *Physical Society of Japan, Journal,* v. 12, Mar. 1957, p. 252-258.

The electrical resistivity and Hall coefficient of p-type synthetic lead telluride crystals and those after heat treatment in the air were measured at various temperatures down to liquid air temperature. After heat treatment at moderate temperature in the air the resistivity and Hall coefficient of the crystals increased. 16 ref. (P15g; Pb, Te)

322-P. (French.) **Measurements on the Magnetic Susceptibility of Germanium.** W. Duchateau and A. Van Itterbeek. *Bulletin de l'Institut International Du Froid* (International Institute of Refrigeration), Supplement, Annexe 1956-2, Sept. 1956, p. 83-89.

Measurements were made on the susceptibility of seven samples of germanium obtained from single crystals of very pure germanium or of germanium containing small amounts of Sb (10^{14}, 10^{17}). The measurements were carried out between room temperature and liquid helium temperatures. For the pure samples an increase was found of the diamagnetic susceptibility of about 5% between room temperature and liquid hydrogen temperatures. In the liquid helium region the susceptibility was nearly constant. (P16, 2-13; Ge, 14-11)

Mechanical Properties and Tests

700-Q. Properties of Cast Iron at Elevated Temperatures. J. R. Kattus. *ASTM Bulletin,* no. 222, May 1957, p. 12.

Preliminary test results of research currently in progress at Southern Research Institute under the sponsorship of the ASME-ASTM Joint Committee on Effect of Temperature on the Properties of Metals. (Q general, 2-12; CI)

701-Q. Application of a New Structural Index to Compare Titanium Alloys With Other Materials in Airframe Structures. *American Society of Mechanical Engineers, Transactions,* v. 79, July 1957, p. 949-958. (CMA)

The formula is presented which was previously used as the structural index for evaluating the strength of airframes. The method is unreliable and does not predict failing load. A new formula which overcomes these difficulties is proposed. Results are compared with compression tests for titanium alloy angles and channels at 70° F. and temperatures extending above 900° F. Ti-100, Ti-8Mn, Ti-6Al-4V, Ti-3Al-5Cr, RC-130A and RC-130B are the alloys for which data are graphed and tabulated. (Q27a, Q28, T24a, 177; Ti)

702-Q. Fatigue, Creep, and Relaxation in Metals. G. R. Gohn. *Bell Laboratories Record,* v. 35, June 1957, p. 201-205.

If the stress conditions are known and can be accurately determined by analysis and from photographic studies, designs can be made that will be relatively free from fatigue failure. Notes on various factors influencing these deterioration processes. (Q7, Q3)

703-Q. Properties of Cast Iron at Elevated Temperatures. J. R. Kattus. *Foundry,* v. 85, June 1957, p. 172-176.

Results from creep-rupture tests at 800° F. with times varying from less than 100 to 5000 hr. on seven cast irons, including ferritic nodular and pearlitic gray irons containing various amounts of alloying elements, molybdenum, nickel and chromium. Measured resistance to thermal shock and thermal fatigue endurance at 800° F.; effect of alloying elements on creep and thermal properties. (Q3m, Q7a, Q10a, 2-12; CI-q, *Mo, Ni, Cr*)

704-Q. Effect of Cold Work on the Creep Rupture Properties of a Series of Simple 18-8 Stainless Steels. Frank B. Cuff, Jr., and Nicholas J. Grant. *Iron and Steel Institute, Journal,* v. 186, June 1957, p. 188-195.

Six simple 18-8 stainless steels were investigated at 1100 and 1200° F. Conclusions were drawn regarding the predictability of high-temperature properties as influenced by alloy content and the degree of cold work. 13 ref. (Q3m, 318; SS)

705-Q. High-Temperature Properties of Cast Iron. J. R. Kattus. *Machine Design,* v. 29, May 30, 1957, p. 100-102.

Results of creep rupture and thermal-shock tests on seven plain and low-alloy cast irons. (Q3m, Q10a, CI)

706-Q. Use of Molybdenum at High Temperatures. R. T. Begeley. *Materials in Design Engineering,* v. 48, July 1957, p. 154, 156, 158, 161-162, 164, 166. (CMA)

Alloys of molybdenum have higher useful strength above 1600° F. than any known materials; a graph shows the superiority over several other alloys. The alloys now available are the solid solution type which achieve maximum strength by strain hardening. Recrystallization temperature sets an important limitation on the operating temperature at which the good effects from working are retained. A number of coatings have been tested in an effort to overcome the oxidation problem above 1000° F. Coated components for jet engine parts show promise up to 2000° F. (Q27a, 2-12, R1h; Mo)

707-Q. Evaluation of a Method of Determining the Tendency of Mild Steel to Brittle Fracture. *Metal Progress,* v. 72, July 1957, p. 154, 158. (Digest from *Centrum Voor Lastechniek N.V.L. — T.N.O.* Report No. SR532/1A, Apr. 1955, 99 p.).

Previously abstracted from original. See item 571-Q, 1956. (Q26s, Q5, Q6; CN)

708-Q. Composition and Mechanical Properties of the Commonly Investment-Cast Alloys. *Precision Metal Molding,* v. 15, June 1957, p. 75-78.

Tabular presentation of composition and mechanical properties of alloys commonly cast as investment castings including stainless, carbon and low alloy toolsteels, nickel-base, copper-base and aluminum-base alloys, high-temperature alloys. (Q general; SS, TS, Ni, Cu, Al, SGA-h, 5-12)

709-Q. Instability of Plastic Flow of Metals at Very Low Temperatures. Z. S. Basinski. *Royal Society Proceedings,* v. 240, May 1957, p. 229-242.

The low-temperature unstable plastic deformation of aluminum alloys is described. It is shown that discontinuities in the stress-strain curve are caused by a localized temperature rise produced during the deformation. The calculated magnitudes of the drops in load and the transition temperature between smooth and discontinuous flow agree reasonably well with the experimental observations. It is believed that all metals would exhibit unstable deformation at sufficiently low temperatures. 13 ref. (Q24, 2-13; Al)

710-Q. Coated Molybdenum-Base Alloys. R. T. Begley. *Society of Automotive Engineers, Journal,* v. 65, June 1957, p. 7071. (CMA)

Alloys of molybdenum have higher useful strength above 1600° F. than any known materials; a graph

shows the superiority over several other alloys. The alloys now available are the solid solution type which achieve maximum strength by strain hardening. Recrystallization temperature sets an important limitation on the operating temperature at which the good effects from working are retained. A number of coatings have been tested in an effort to overcome the oxidation problem above 1000° F. Coated components for jet engine parts show promise up to 2000° F.
(Q27a, 2-12, L general; Mo)

711-Q. Secondary Hardness in Steels Alloyed With Vanadium, Molybdenum and Titanium. L. V. Zaslavskaia, et al. *Academy of Sciences of the USSR Bulletin. Physical Series,* v. 20, no. 6, 1956, p. 624-628. (Columbia Technical Translations.) (CMA)

Previously abstracted from the original. See item 981-Q, 1956.
(Q29, J29, AY)

712-Q. (English.) **Internal Friction and Imperfections in Copper.** D. H. Niblett and J. Wilks. *Bulletin de l'Institut International Du Froid* (International Institute of Refrigeration), Supplement, Annexe 1956-2. Sept. 1956, p. 23-30.

Effects of imperfections on the internal friction of metallic crystals, in particular at low temperature. Investigations were primarily concerned with the effect of cold work on the internal friction of 99.999% polycrystalline copper. The specimens took the form of bars 12 cm. long, 1 cm. wide and about 1.5 mm. thick, which were given a preliminary anneal at 600° C. and then plastically deformed by longitudinal extension at room temperature. 7 ref. (Q22, M26s, 2-13; Cu)

713-Q. (English.) **On the Vibrational Damping of Structural Steel Beams.** Yoshikazu Yamada. *Kyoto University, Faculty of Engineering, Memoirs,* v. 19, no. 1, Apr. 1957, p. 1-13.

Experimental results and their consideration on the vibrational damping characteristics of model beams, and of actual steel highway bridges. The fundamental characteristics of damping due to internal frictions of the steel beam and the friction of bearing are clarified by using three kinds of beams; the damping characteristics of several bridges have been investigated and are compared with the results obtained by the experiments on model beams. (Q22; ST, SGB-s)

714-Q. (English.) **Investigation on Acid-Resistant High-Silicon Iron. Pt. 3. Effects of Cooling Rate and Annealing on Mechanical Properties and Corrosion Resistance.** Hiroshi Sawamura, Osamu Tajima and Kyoichi Akamatsu. *Kyoto University, Faculty of Engineering, Memoirs,* v. 19, no. 1, Apr. 1957, p. 77-91.

Variations in cooling rate bring about great changes in graphite structure and influence mechanical properties although not corrosion resistance. The annealing of castings is important only with respect to the relief of internal casting stress. 6 ref. (Q general, R general, E25n; Fe, *Si*, SGA-g)

715-Q. (French.) **Influence of Mechanical Stresses on Metallic Surfaces by Means of the Russel Effect.** C. Berger. *Métaux-Corrosion-Industries,* v. 32, May 1957, p. 185-190.

On the surface submitted to tension the deformation exceeds the elastic point of the aluminum film which is broken, resulting in an intense Russel effect. On the compressed surface the aluminum film is deformed without breaking and consequently does not provoke a Russel effect. 3 ref. (Q25k)

716-Q. (French.) **Thermal Behavior of Titanium and Its Alloys.** R. Syre. *Métaux-Corrosion-Industries,* v. 32, May 1957, p. 201-207. (CMA)

The behavior of titanium and its alloys at elevated temperatures. The properties examined included Young's modulus, flow characteristics and structural changes. Titanium alloys commercially available in France were used; their designations and compositions are indicated in a table. It was found that a 3-6% Al alloy gave the most satisfactory high-temperature characteristics. 4 ref. (Q general, 2-12; Ti)

717-Q. (French.) **Structure and Heat Treatment of T-A6V Forged Alloy.** Adrien Saulnier and Robert Syre. *Revue de L'Aluminium,* no. 243, May 1957, p. 505-514.

Studies carried out in France for the commercial development of one of the latest titanium alloys. Determination of mechanical properties and of microstructures in relation to heat treatments, one of which, at 850° C., provides a wide interval of plasticity, while another, at 950° C., followed by aging, provides very high mechanical properties. 4 ref. (Q general, M27, 2-14; Ti)

718-Q. (German.) **Creep Rate of Heat Resistant Alloys.** Kurt Schaar. *Archiv für das Eisenhüttenwesen,* v. 28, Mar. 1957, p. 145-152.

Creep properties of a nickel alloy of 76% nickel and 20% chromium, at 650 to 750° C.; determination of validity of a formula developed by E. N. Andrade; calculations and references for practical test evaluation especially for the embrittlement of metals. 24 ref.
(Q3n, 1-4; Ni, Cr, SGA-h)

719-Q. (German.) **Solution of Various Problems of Fatigue by Means of the "Stepwise" System.** Hans Bühler and Walter Schreiber. *Archiv für das Eisenhüttenwesen,* v. 28, Mar. 1957, p. 153-156.

Statistical basis and prerequisites for the use of the "stepwise" system; determination of cyclic stress concentration factor as well as fatigue crack with smooth and notched samples of steel CK 10 during the rotating beam test. 9 ref. (Q7c, Q25k; ST)

720-Q. (German.) **The Impact Test.** W. Späth. *Metall,* v. 11, July 1957, p. 598-604.

A new impact test device (Izod test) was developed, measuring both the energy absorption and the peak load at the moment of impact. A series of tests on sintered aluminum, glass-fiber reinforced plastics and carbides was conducted. Relations between energy absorption, peak load and deformation were established experimentally. 5 ref.
(Q6, 1-3)

721-Q. (German.) **Effect of the Nitrogen Linkage by Aluminum on the Properties of High-Strength Structural Steels.** Hans Joachim Wiester, Walter Bading, Helmut Riedel and Werner Scholz. *Stahl und Eisen,* v. 77, June 13, 1957, p. 773-783.

Determination of the effect of finely divided inclusions of aluminum nitride on the grain size, mechanical properties and notch toughness in the normalized and artificially aged condition of experimental steel melts of 10, 50, or 1000 kg. of weight, prepared in the high-frequency furnace; testing the weldability and the hot hardness; effect of up to 0.1% phosphorus on the notch toughness of fine-grained steels. (Q general, M27c, 2-10; ST, SGB-a; *N, Al*)

722-Q. (German.) **Effect of Segregation, Cold Working and Aging on the Notch Toughness of Structural Steels of the Rimming Type.** Hermann Schenck and Eugen Schmidtmann. *Stahl und Eisen,* v. 77, June 13, 1957, p. 784-791.

Notch toughness - temperature curves of mild, rimming-type basic converter steel, of steel blown according to special procedures and of openhearth steel, as normalized, using samples taken from the segregation zone of the rolled product (slabs, sheet bars and billets); effect of cold working by stretching or upsetting and of an artificial aging with different tempering temperatures after cold working on the location of the steep incline of the notch toughness-temperature curves and on the maximum value of the notch toughness in the high level, as measured on a plain carbon, killed electric furnace steel containing 0.03% C and on a rimming-type basic converter steel with 0.06% C. (Q23s, 3-18, 2-15; ST-d)

723-Q. (German.) **Adequate Use of the Notch Toughness Value in the Current Assessment of the Tendency to Brittle Fracture and of the Weldability of Conventional Structural Steels.** Heinz Kornfeld. *Stahl und Eisen,* v. 77, June 13, 1957, p. 792-797.

Statistical analysis of the variations in the shape of the notch toughness-temperature curves for heavy plates made of conventional structural steels. Numerical relationship between the relative values of the medium notch toughness and the medium percentage crystallinity in the fracture of DVM and Charpy V-notch test bars. Conclusions to be drawn for an adequate definition of the transition temperature and for the possibilities of intelligent testing of materials.
(Q23s, Q26s, K9s; ST, SGB-s)

724-Q. (German.) **Deoxidation and Technological Characteristics of Killed Basic Converter Steels. Pt. 2. Contents of Inclusions, Degree of Purity and Characteristics of Killed Basic Converter Steels.** Erwin Plockinger and Rupert Rosegger. *Stahl und Eisen,* v. 77, June 13, 1957, p. 798-804.

Investigations on basic converter steels containing manganese which had been deoxidized with silicon alone, with silicon and an addition of small amounts of aluminum, with silicon and aluminum in appropriate equal proportions, or with aluminum alone. Determination of the content, repartition and shape of the nonmetallic oxide inclusions in the cast ingot. Results of tensile, bending notched-bar impact tests, and bending tests on surface-welded specimens.
(Q27a Q5g, Q6n, D11r; ST-c, 9-19)

725-Q. (Japanese.) **Studies on Mechanical and Wear Resisting Properties of Low Mn-Mo Steel Castings.** Seishiro Miyazaki. *Iron and Steel Institute of Japan, Journal,* v. 43, Apr. 1957, p. 466-470.

Mechanical and abrasion resisting properties of low Mn-Mo steel cast-

ings containing 1.1-1.7% Mn and 0.2-0.4% Mo were investigated. Heat treatments used were homogenizing and normalizing or double normalizing. Tempering was carried out by furnace cooling from 600-550° C. Wear resistance of 1.20% Mn steel castings was superior to that of 1.63% Mn or 0.52% C and 1.39% Mn steel castings.
(Q9n, 2-14; AY, *Mn, Mo,* 5)

726-Q. (Japanese.) **On the Fatigue Behavior of Commercially Pure Titanium. II.** K. Takeuchi. *Light Metals (Tokyo),* v. 7, May 1957, p. 82-87. (CMA)

Mean stress versus fatigue properties were studied for annealed and 50% cold rolled titanium sheet on Schenk's vibrating sheet bending machine. Notch effects on the fatigue strength of annealed titanium rods were studied on Ono's rotary bending machine. Mechanical and chemical composition data are tabulated, and the endurance limit diagram and S-N curves are shown. 10 ref. (Q7g; Ti-a)

727-Q. (Japanese.) **Ultra-High-Strength Steel.** Chiaki Asada. *Metals,* v. 27, June 1957, p. 482-486.

Characteristics, chemical compositions, heat treatment; relationship between the tempering and mechanical properties of ultra-high-strength steel. 4 ref.
(Q general, J general; ST, SGB-a)

728-Q. (Russian.) **Properties of Cast Alloy Structural Steel.** B. B. Gulaev, I. A. Shapranov, V. M. Shpeitzman and P. E. Kovalenko. *Liteinoe Proizvodstvo,* no. 2, Feb. 1957, p. 11-16.

Composition, tensile strength, relative elongation and compression, impact resistance and Brinell hardness of six low-alloy steels. Superior qualities of the castings obtained from the alloy steel are stressed. Graphs of the impact resistance of the steels as a function of cooling time and low temperature are presented. Mechanical properties of samples cut out of experimental castings are tabulated and a graph of the steels' fluidity is given. Crack formation and weldability are discussed.
(Q general, E25p, K9s; AY, 5)

729-Q. Multiple Slip in Bicrystal Deformation. J. D. Livingston and B. Chalmers. *Acta Metallurgica,* v. 5, June 1957, p. 322-327.

Experimental observation of slip lines on aluminum bicrystals deformed in tension. Emphasis was on the multiple slip associated with the interaction between two crystals at the boundary. Model employing pile-up of dislocations at grain boundary led to a method of predicting which additional slip systems will operate in a given bicrystal. 18 ref. (Q24a, M26)

730-Q. Non-Linear Elasticity in Aluminium Alloys. A. B. Watts. *Aeronautical Quarterly,* v. 8, May 1957, p. 103-122.

Tests have been carried out on round bar specimens of various strong aluminum alloys (unclad) in the fully heat treated condition in both tensile and compressive loading. A careful study of the results establishes beyond reasonable doubt that there is a progressive change in the tangent elastic modulus with stress. The variation is appreciably greater than that predicted by the consideration of second-order effects in the conventional stress and strain representation. (Q21; Al)

731-Q. Manufacture and Metallurgy of Flash-Welded Line Pipe. Merrill A. Scheil, George E. Fratcher, Scott L. Henry and Ewald H. Uecker. *American Society of Mechanical Engineers,* Paper no. 57-ASME-EIC-3, 18 p.

Burst tests were conducted down to −50° F. Charpy V-notch-bar tests were made on the pipe material over a range of −100 to +212° F. to determine the energy-temperature transition curves. 7 ref.
(Q23, Q6, K3r)

732-Q. Brittle Fracture in Steel as Related to Flash Welded Line Pipe. Pt. 2. Merrill A. Scheil, George E. Fratcher, Scott L. Henry and Ewald H. Uecker. *American Society of Mechanical Engineers,* Paper no. 57-ASME-EIC-4, 8 p.

Metallurgical concepts of brittle fracture and design methods to safeguard against it. 13 ref.
(Q26s, K3r)

733-Q. Variability of Mechanical Properties of Flat Rolled Sheet Product. John V. Sturtevant. *American Society for Quality Control, National Convention Transactions,* May 1957, p. 181-190.

Variabilities found in Olsen ductility cup tests made on 25 sheets of rimmed steel taken from the middle of the lengths of 25 coils rolled straightaway on a conventional mill.
(Q23p; ST, 4-3)

734-Q. Observations on the Stress-Strain Behaviour of a Series of Unalloyed High-Duty Pearlitic Irons of the Inoculated Type. H. K. Lloyd and J. V. Harding. *British Foundryman,* v. 50, July 1957, p. 352-358.

Relationship between tensile strength and various elastic and plastic properties for six irons. These include elastic modulus values at different applied stresses and conventional values of elastic limit. Effects of structure, mass effect and rate of stressing on these properties. 9 ref. (Q27a, Q21; CI)

735-Q. Creep-Resisting Steel Castings for Use at Medium and High Temperatures. H. Zeuner. *Foundry Trade Journal,* v. 102, May 30, 1957, p. 657-663.

Creep resisting properties necessary in castings for use at high temperatures and pressures found in gas turbine and furnace application. Chemical composition and mechanical properties of several typical high-temperature cast steels of low, medium or high-alloy types. 7 ref. (Q3m, 2-12, 3-24; ST, 5-10)

736-Q. Boron Solves "Hot Shortness" in Stainless Steels. D. I. Loveless and F. K. Bloom. *Iron Age,* v. 179, June 20, 1957, p. 95-97.

Small additions of boron improve hot working performance. Table of levels of boron satisfactory for various grades from hot working and structural standpoints.
(Q26s, 2-10; SS, *B*)

737-Q. For High-Temperature Strength: Stainless or Tool Steel? E. A. Loria. *Iron Age,* v. 179, June 13, 1957, p. 132-135.

On basis of design requirements, toolsteels achieve a higher level of tensile and yield strength over the range of 72-1100° F.
(Q27a, 2-12; SS, TS)

738-Q. Effect of Alloying Elements on Tensile Strength. J. Glen. *Iron and Steel,* v. 30, June 1957, p. 295-312.

Effect on high-temperature tensile properties of low-carbon steel was investigated for the following alloys: manganese, chromium, molybdenum, tungsten, vanadium, titanium, silicon nickel and copper.
(Q27a, 2-10; CN, AY)

739-Q. Properties of Cast Iron at Elevated Temperatures. J. R. Kattus. *Iron and Steel,* v. 30, July 1957, p. 356.

Seven plain and low-alloy cast irons were tested for creep-rupture and thermal shock. Table of 10-year rupture strength and thermal-fatigue endurance limit at 800° F.
(Q3m, Q7a, Q10a; CI)

740-Q. Brittle Failure in Ductile Steel. S. A. Main. *Iron and Steel,* v. 30, July 1957, p. 365-367.

A tentative method of testing intended for static tensile operation to provide stress figures, which should be adaptable as an impact tensile test. 4 ref. (Q26s, Q27b; ST)

741-Q. Study of Temper-Brittleness in Cr-Mn Steel Containing Large Amounts of Molybdenum, Tungsten and Vanadium. A. E. Powers. *Iron and Steel Institute, Journal,* v. 186, July 1957, p. 323-328. (CMA)

Additions of molybdenum and vanadium together decrease the susceptibility to temper-brittleness while the single additions increase it. Results are considered from the viewpoint that susceptibility to temper brittleness is controlled by the interaction energy for granular segregation of the solute additions and by the diffusion rates of the segregating elements. (Q26s, 2-10; AY)

742-Q. Effect of Stress on Creep at High Temperatures. H. Laks, C. D. Wiseman, O. D. Sherby and J. E. Dorn. *Journal of Applied Mechanics,* v. 24, June 1957, p. 207-213.

Experimental investigation on relationship of high-temperature creep rate to stress in pure aluminum and its solid solution alloys. Conditions include both low and high stresses. Discusses observations in light of a theoretical dislocation climb model for high-temperature creep. 14 ref.
(Q3, 2-12, 3-16; Al)

743-Q. Statistical Appraisal of the Prot Method for Determination of Fatigue Endurance Limit. W. A. Hijab. *Journal of Applied Mechanics,* v. 24, June 1957, p. 214-218.

Statistical analysis of precision of the estimate of endurance limit as determined by Prot method. Statistical efficiency found to be less than probit and staircase method: found that optimum efficiency of Prot method achieved only when two rates of increase of stress as widely separated as possible are used. 12 ref. (Q7a, S12)

744-Q. Stress Distributions in Rotating Disks Subjected to Creep at Elevated Temperature. A. M. Wahl. *Journal of Applied Mechanics,* v. 24, June 1957, p. 299-305.

Curves of stress distribution as function of radius calculated for various temperatures and thicknesses of rotating chromium steel disks, subjected to steady-state creep at elevated temperatures.
(Q3, 2-12; AY)

745-Q. A Note on the Metallography of Cracking During Creep. D. McLean. *Journal of the Institute of Metals,* v. 85, July 1957, p. 468-472.

Commercial creep resistant metals, broken in creep tests at various stresses and temperatures, were examined. At low stress fractures began by formation of isolated cavities lying mainly in transverse grain boundaries; at high stress, fracture

started with cracks which appeared to be produced by relatively large stress concentrations. 13 ref. (Q3, Q26)

746-Q. Effect of Heat Treatment and Structure on the Creep and Stress-Rupture Properties of Nimonic 80A. W. Betteridge and A. W. Franklin. *Journal of the Institute of Metals,* v. 85, July 1957, p. 473-479.

Three factors control creep characteristics: Time and temperature of solution treatment determines creep rate; precipitation of chromium carbide at grain boundaries determines amount of creep; time and temperature of normal hardening phase affect both creep rate and extension at fracture. 5 ref. (Q3m, 2-14, 3-21; Ni)

747-Q. Intercrystalline Cracking in Creep of Some Aluminum Alloys. B. J. Nield and A. G. Quarrell. *Journal of the Institute of Metals,* v. 85, July 1957, p. 480-488.

Two high-purity aluminum alloys containing 1.28 and 5.15% manganese were studied. Constant-strain-rate method of deformation was employed. General theory of intercrystalline cracking is proposed. 3 ref. (Q3; Al)

748-Q. On a Mechanism of High Temperature Intercrystalline Cracking. C. W. Chen and E. S. Machlin. *Journal of Metals,* v. 9; *AIME Transactions,* v. 209, July 1957, sec. 2, p. 829-835.

Formation of voids at grain boundaries is considered to be primarily responsible for brittle failure of metals at elevated temperature. Voids once nucleated grow either by vacancy condensation or plastic yielding or both. 13 ref. (Q26s, 2-12; Cu)

749-Q. Tensile Properties of Zone Refined Iron in the Temperature Range from 298° to 4.2° K. R. L. Smith and J. L. Rutherford. *Journal of Metals,* v. 9; *AIME Transactions,* v. 209, July 1957, sec. 2, p. 857-864.

The higher the purity, the lower the flow stresses and the better the low-temperature ductility. Major portion of ductility at 4.2° K. arises from twinning; prestraining at room temperature does not suppress twinning at 4.2° K. 36 ref. (Q27a, Q24b; Fe)

750-Q. Temperature Dependence of the Hardness of Secondary Phases Common in Turbine Bucket Alloys. J. H. Westbrook. *Journal of Metals,* v. 9; *AIME Transactions,* v. 209, July 1957, sec. 2, p. 898-904.

Most common types of secondary phases in turbine bucket alloys were synthesized in bulk and hardness measured from room temperature to 800° C. High hot hardness of the dispersed phase is an important factor in high-temperature strength of alloys but other factors are also significant. 68 ref. (Q29n, 2-12; SGA-h)

751-Q. Shear Along Grain Boundaries in Aluminum Bicrystals. S. K. Tung and R. Maddin. *Journal of Metals,* v. 9; *AIME Transactions,* v. 209, July 1957, sec. 2, p. 905-910.

Aluminum bicrystals 99.99% pure having a pure tilt boundary about the <110> axis were subjected to creep stresses along their boundary at various temperatures. Mechanism for grain boundary shear is considered to be a combination process involving slip and grain boundary self-diffusion. 18 ref. (Q2g; Al)

752-Q. Abrupt Yielding and the Ductile-to-Brittle Transition in Body-Centered-Cubic Metals. E. T. Wessel. *Journal of Metals,* v. 9; *AIME Transactions,* v. 209, July 1957, sec. 2, p. 930-935.

Abrupt yielding and transition from a ductile-to-brittle behavior are shown to be closely related to one another and to a common origin. Mechanism is described for abrupt yielding and the ductile-to-brittle transition. 20 ref. (Q23r, Q26s)

753-Q. Relative Creep Resistance of Cast Al-Si-Cu Alloys to LM4 and LM21. J. McKeown and R. D. S. Lushey. *Metallurgia,* v. 56, July 1957, p. 27-28.

Tests show there is no marked difference at 200° C. in creep resistance of the alloys containing 0.35 and 2% zinc. (Q3m, 2-10; Al, Zn)

754-Q. Testing Sheet Metal for Drawing. *Metalworking Production,* v. 101, May 10, 1957, p. 795-797.

Machine for performing Swift cup forming test and other tests on drawability of sheet metal, of single-stage cup forming or stretch-forming types. (Q3q, G4)

755-Q. Plastic Deformation of Aluminum Single Crystals at Elevated Temperatures. R. D. Johnson, A. P. Young and A. D. Schwope. *National Advisory Committee for Aeronautics,* Report 1267, 1956, 31 p.

Experiments were carried out by two different methods on the effect of small amounts of prestraining, on the creep and tensile properties of aluminum single crystals. Two high-resolution X-ray techniques used to detect and to follow the strain in these experiments showed a definite polygonization of the crystalline lattice during creep. 70 ref. (Q24, Q27a, Q3m, 2-12; Al, 14-11)

756-Q. Rare Earth Alloys Promise New Strength for Steel. *Petroleum Engineer,* v. 29, Aug. 1957, p. B76. (CMA)

An alloy steel developed for armor plate shows promise in many applications. One-half lb. per ton of lanthanum, cerium or lanthanon mixtures is added, giving improved impact values, lower transition temperatures, and 20-60% higher reduction of area at all temperatures. Hardenability is the same as that of ordinary steel. Tempering in the temper-brittle range permits adequate ductility. (Q general; AY, EG-g)

757-Q. On the Activation Energy of High Temperature Creep in Metals. Paul Feltham. *Philosophical Magazine,* v. 2, May 1957, p. 584-588.

The temperature dependence of the activation volume of "stress-concentration factor" q appearing in the expression $de/dt = A \exp(-H/kT) \sinh(q\sigma/kT)$ relating the equilibrium tensile creep rate de/dt, the temperature T and the applied tensile stress σ has been studied in the case of several pure metals subject to creep above about $\frac{1}{2}T_m$, where T_m is the melting point. 10 ref. (Q3m, P13a)

758-Q. Dislocation Locking and Fracture in X-Iron. J. Heslop and N. J. Petch. *Philosophical Magazine,* v. 2, May 1957, p. 649-658.

The inhibition of plastic deformation by dislocation locking promotes brittleness. The influence of manganese in iron is studied in detail and it is concluded that the ductility conferred by the manganese is associated with weakened dislocation locking as well as with grain refinement. The weakening of the locking appears to be due to interaction between nitrogen and manganese atoms. 12 ref. (Q24; Fe, Mn)

759-Q. Thermal Stress Fatigue. L. F. Coffin, Jr. *Product Engineering,* v. 28, June 1957, p. 175-179.

Difference between mechanical and thermal fatigue; origin of thermal stresses; design criteria to use. (Q7j)

760-Q. Vibration Tests. Robert W. Stephens. *Steel,* v. 140, May 20, 1957, p. 168, 171, 172, 175.

Suggestions on testing structures by vibration; fatigue tests, specification tests; procedures for tests. (Q10, Q7, 1-4)

761-Q. Thin Strip Hardness Can Be Misleading. John T. Richards. *Steel,* v. 141, July 1, 1957, p. 86-87.

Effect of strip thickness on hardness. Hardness readings can vary without corresponding change in strength. Tensile tests are more accurate. (Q29n, 3-23; 4-3)

762-Q. New Ti Alloy. *Steel,* v. 141, July 29, 1957, p. 131. (CMA)

Rem-Cru has developed a titanium alloy with 6.5% Al and 3.75% Mo, designated C-130AMo, which has the advantages of improved time-temperature stress stability, deep hardenability, better high-temperature strength, and good heat treated properties. A graph compares properties with those of other alloys. The alloy has promise in jet engine disks and blades and in fasteners and airframe forgings. (Q general; Ti)

763-Q. Effect of Sodium on the Mechanical Properties of Zirconium. J. C. Bokros. *U. S. Atomic Energy Commisssion,* NAA-SR-1867, June 15, 1957. 39 p. (CMA)

The surface oxide which develops lowers the fatigue life at high temperatures but hydrogen has little effect on the fatigue life. The grain growth which occurs above 950° F. reduces fatigue life severely. Sodium does not harm hot tensile properties. Data show that zirconium is stable to dimensional changes after thermal cycling. (Q general; Zr, *H, Na*)

764-Q. Use of Titanium Alloy Sheet in Airframe Components. L. R. Jackson. Battelle Memorial Institute. Titanium Metallurgical Laboratory, Report 5A. *U. S. Office of Technical Services,* PB 124790. July 1955, 23 p. (CMA)

Commercially realizable and quantitatively significant criteria are presented for the strength-weight ratios of titanium sheet alloys. Other factors governing the use of sheet materials are discussed. Although higher strength alloys might broaden use, other less favorable effects begin to operate at very high strength levels. (Q23, T24a, 17-7;Ti)

765-Q. Crack Propagation in the Hydrogen-Induced Brittle Fracture of Steel. W. J. Barnett and A. R. Troiano. Case Institute of Technology (Wright Air Developments Center.) *U. S. Office of Technical Services,* PB 121065, Aug. 1955, 58 p. $1.50.

Static fatigue fracture process in high-strength steel was found to be one of almost immediate crack initiation after loading above the static fatigue limit, then "slow" crack growth followed by cataclys-

mic crack propagation, or fracture. A newly developed electrical resistance method for measuring crack growth permitted analysis of the kinetics of the crack propagation process and the factors which determine the static fatigue fracture stress. (Q26s; ST, SGB-a)

766-Q. Research on Effect of Prestraining and Notch Sharpness on the Notch Strength of Materials. G. W. Geil and N. L. Carwile. Wright Air Development Center, Technical Report 56-402. *U. S. Office of Technical Services,* PB 121782. Oct. 1956, 113 p. (CMA)

Ti-75A and C130AM were studied for the effect of prestraining in tension at room and liquid nitrogen temperatures on the tensile properties; some specimens were in the notched conditions. Impact properties of Charpy V-notch specimens in the −196 to 300° C. range were determined. (Q23s, 2-13; Ti)

767-Q. Hydrogen Contamination in Titanium and Titanium Alloys. Pt. 2. Strain Aging Hydrogen Embrittlement in Alpha-Beta Titanium Alloys. H. M. Burte. Wright Air Development Center, Technical Report 54-616. Pt. 3. *U. S. Office of Technical Services,* PB 121786, Oct. 1956, 51 p. (CMA)

Susceptibility to strain-aging embrittlement is affected by composition and microstructure. Higher temperatures decrease the tendency but increase the rate. A mechanism for strain aging embrittlement is proposed. Other types of hydrogen embrittlement are noted.
(Q26s, N7e; Ti)

768-Q. Cumulative Fatigue Damage of Aircraft Structural Materials. Pt. 2. 2024 and 7075 Aluminum Alloy—Additional Data and Evaluation. A. M. Freudenthal and R. A. Heller. Columbia University (Wright Air Development Center.) *U. S. Office of Technical Services,* PB121909, Oct. 1956, 27 p. 75¢.

Tests were conducted on 20 unnotched specimens of 2024 and 7075 aluminum alloys to determine the effect on fatigue life of randomly varying stress-amplitudes representing gust or maneuver load sequences encountered during flights. A nonlinear cumulative damage theory was developed that approximated test results reasonably well for unnotched specimens used in the tests. Tentative conclusion is that with decreasing severity of the load distribution the comparative fatigue performance of alloy 7075 improves, but for increasingly severe distribution 2024 is definitely the more reliable material. (Q7a; Al)

769-Q. The Relation of Heat Treatment to the Dynamic Properties of Some Carbon Steels. R. C. Smith. Naval Research Laboratory. *U. S. Office of Technical Services,* PB 121514, Nov. 1956, 16 p. 50¢.

SAE 1035 and 1045 specimens that had been annealed or quenched and tempered were subjected to static or dynamic axial loads. The dynamic yield stress was a maximum for specimens tempered in 800 to 1100° F. range. Data showed ductility to be generally higher for the dynamic tests than for the static tests. The ratio of dynamic yield stress to static yield stress was smaller at the lower tempering temperatures. (Q23b, 2-14; CN)

770-Q. Properties of Constructional Metals as a Function of Temperature and Strain Rate in Torsion. E. P. Klier. Syracuse University (Wright Air Development Center). *U. S. Office of Technical Services,* PB 121912, Nov. 1956, 201 p. $4.

Torsion tests were conducted on cylindrical and tubular specimens of structural alloys to evaluate the reduction of the modulus of rupture that was observed in previous research to accompany increasing strain rate. The cause of the reduction in strength, its magnitude and the generality of the phenomenon were investigated. Results confirmed the trends established earlier that the modulus of rupture of the structural metals was reduced in the ambient temperature range with increasing strain rate.
(Q1a; SGB-s)

771-Q. Relaxation Behavior of Titanium Alloys. F. J. Gillig. Wright Air Development Center, Technical Report 55-458, Pt. 2. *U. S. Office of Technical Services,* PB 121978, Dec. 1956, 87 p. (CMA)

Relaxation tests were made on heat treated A-70, C-130AM and A-110AT in all of the microstructural conditions at 70, 600 and 800° F. The equipment is described. The grain size effect was similar to that in creep testing where the larger sizes resisted deformation more only at the higher test temperatures.
(Q3a, 1-3; Ti)

772-Q. Wear Studies With Titanium. R. J. Benzing and A. N. Damask. Wright Air Development Center, Technical Report 56-375. *U. S. Office of Technical Services,* PB 121885, Jan. 1957, 20 p. (CMA)

Typical oils were used in a wear study of titanium (i.e., mineral oil, diester, silicate ester, silicone, halogenated hydrocarbon). Test equipment described. The Ti-150A, C-130AM and Ti-3Al-5Cr specimens were tested with surfaces in the cyanided and uncyanided conditions. (Q9n, 1-3, 1-4; Ti, Nm-h)

773-Q. Effect of Microstructural Variables and Interstitial Elements on the Fatigue Behavior of Titanium and Commercial Titanium Alloys. C. B. Dittmar, G. W. Bauer and D. Evers. Wright Air Development Center, Technical Report 56-304. *U. S. Office of Technical Services,* PB 121972, Jan. 1957, 96 p. (CMA)

Microstructure versus fatigue behavior was studied for Ti-6Al-4V, Ti-3Mn complex and Ti-5Al-2.5Sn. Endurance limit was not much affected unless the structure was extremely coarse or embrittled. Interstitial contents at the level of commercial titanium were studied for the three alloys. At this interstitial level the fatigue life is increased or unchanged. (Q7a, 3-21; Ti)

774-Q. Evaluation of Bend Testing of Titanium Sheet. W. P. Achbach and E. G. Bodine. Battelle Memorial Institute, Titanium Metallurgical Laboratory, Report 68. *U. S. Office of Technical Services,* PB 121626, Apr. 1957. (CMA)

The literature of bend testing is reviewed and apparatus, procedures and specimen types now used are described prior to recommendation of a uniform bend test procedure for titanium sheet. (Q5, 1-4; Ti)

775-Q. Notch Sensitivity of Titanium and Titanium Alloys. F. C. Holden. Battelle Memorial Institute, Titanium Metallurgical Laboratory, Report 69. *U. S. Office of Technical Services,* PB 121627, Apr. 1957, 91 p. (CMA)

Testing programs are discussed in the light of present knowledge of the mode of failure of notched specimens. Recommendations are made for further studies. (Q23s; Ti)

776-Q. Fracture Characteristics of Copper-Base Alloys. N. C. Howells and E. A. Lange. Naval Research Laboratory. *U. S. Office of Technical Services,* PB 121933, Apr. 1957, 12 p. 50¢.

Drop-weight and Charpy V tests conducted at temperatures between 210 and −300° F. showed that the fracture relationships of 15 Navy copper-base alloys were different from those of steel in that a Charpy V energy level of 10 ft-lb. does not indicate a brittle condition for copper-base alloys. The alloys with Charpy V energy values from 3 to 10 ft-lb. were found to deform plastically even in the presence of a sharp notch. (Q26, Q6; Cu)

777-Q. Fatigue Resistance of Simulated Nozzles in Model Pressure Vessels. George Welter and Julien Dubuc. *Welding Journal,* v. 36, June 1957, p. 271s-274s.

Tests were made on vessels of A201, Grade A, and A302, Grade B steels under cyclic internal pressure. All fractures in the nozzles occurred in longitudinal direction of the pressure vessels and began at edge where the nozzle hole meets with the internal surface of the vessel shell. (Q7, T26q; ST)

778-Q. Plastic Behavior of Structural Members and Frames. George C. Driscoll, Jr., and Lynn S. Beedle. *Welding Journal,* v. 36, June 1957, p. 275s-286s.

Report of demonstration tests conducted during summer course "Plastic Design in Structural Steel" at Lehigh University. New design concept was presented by which maximum strength of structural steel is revealed by analysis of plastic rather than elastic behavior under load. 5 ref. (Q23, 17-1; ST, SGB-s)

779-Q. Effect of Neutron Irradiation on the Mechanical Properties of Some Structural Steels. E. E. Baldwin. *Welding Journal,* v. 36, July 1957, p. 342s-347s.

A302 steel showed little or no change in properties. A201 showed substantial increase in strength and loss of ductility and energy absorption. Recovery of A201 damage could be accomplished by annealing at 600° F. 11 ref.
(Q general, 2-17; ST, SGB-s)

780-Q. Effect of Surface Condition on the Fatigue Resistance of Hardened Steel. G. H. Robinson. Paper from "Fatigue Durability of Carburized Steel", American Society for Metals, 1957, p. 11-46.

Investigates effect of surface decarburization on fatigue durability of hardened spring steel by directional bending at different magnitudes of stress; effects of excess carbide in discontinuous network in carburized case; core hardness and intergranular oxidation occurring at surface of steel when carburized by conventional methods.
(Q7a, J4a, J28g; ST)

781-Q. Residual Stresses in Carburized Steels. William S. Coleman and Milton Simpson. Paper from "Fatigue Durability of Carburized Steel", American Society for Metals, 1957, p. 47-67.

Data on the distribution of residual stress following gas carburizing of SAE 8620, 8640, 8617, 1010,

1018 and 9310 steel specimens using different atmospheres, material of varying core hardness, varying case depth and following tempering or refrigeration; stresses measured by sectioning or X-ray diffraction method. (Q25h, J28g; ST)

782-Q. Fatigue Durability of Carburized Steels. J. G. Roberts and R. L. Mattson. Paper from "Fatigue Durability of Carburized Steels", American Society for Metals, 1957, p. 68-105.

One-directional bending fatigue test conducted on variously carburized and hardened steel specimens in effort to correlate residual stresses as introduced by heat treatment with fatigue properties. Variables examined were material composition, case depth, section size, tempering, refrigeration and removal of thin surface by electropolishing. (Q7a, Q25h, J28g; ST)

783-Q. Metallurgy at Low Temperatures. C. S. Barrett. *American Society for Metals, Transactions,* v. 49, 1957, p. 53-117.

The 1956 Campbell Memorial Lecture which deals with the purpose and some results of low-temperature research, the problem of brittle fracture, crystallography and transformations, radiation effects. 155 ref. (Q general, 2-13)

784-Q. Study of Mechanism of Effect of Boron by the Internal-Friction Method. M. V. Pridantsev, et al. *Doklady Akademii Nauk,* v. 111, 1956, p. 98-101. (*Henry Brutcher Translation* no. 3953).

Experimental procedure in measuring internal friction; temperature dependence of internal friction in steel without boron and with 0.002, 0.004, 0.006 and 0.008% boron. Nature of low and high-temperature maxima of internal friction and effect of preliminary heat treating of specimens. Variation of modulus of shear and of impact values. (Q21; ST, *B*)

785-Q. Effect of Hydrostatic Pressure Upon the Hardness of Carbon Steel. V. A. Gladkovskii. *Fizika Metallov i Metallovedenie.* v. 3, 1956, p. 183-184. (*Henry Brutcher Translation* no. 3941).

Usefulness of determination of effect of hydrostatic pressures on hardness of materials for learning about behavior when pierced by a projectile and for developing a nondestructive method of measuring residual stresses. Experimental setup and procedure; results obtained on a 0.26% C, 0.5% Mn steel. Conclusions as to limitations of use of dependence of hardness on tensile strength for range of high pressures. (Q29n, 3-24; Q25h; CN)

786-Q. Creep Resistance of Alloys as Function of Their Composition. A. A. Bochvar. *Izvestiya Akademii Nauk, OTN,* no. 1, Jan. 1957, p. 136-138. (*Henry Brutcher Translation* no. 3945).

Theory that creep resistance is improved by a hetergeneous structure and attempt to correlate this theory with that which ascribes most importance to a multicomponent solid solution. Recommended line to follow in future searches for new creep-resisting alloys. (Q3m, 2-10)

787-Q. High-Temperture Fatigue Tests With Repeated or Cyclic Tensile Stressing. G. Vidal and P. Lanusse. *La Recherche Aéronautique,* v. 45, May-June 1955, p. 45-51. (*Henry Brutcher Translation* no. 3898).

Particulars on apparatus used; furnace, fatigue testing machine and its operation; mean-load controller and recorder; monitoring the mean-load variations; correcting system; recording the fluctuating component of load simultaneously with temperature. (Q7j, 1-3)

788-Q. Mechanical Nature of Temper Brittleness. N. V. Tolstoguzov. *Metallovedenie i Obrabotka Metallov,* v. 2, 1956, p. 28-30. (*Henry Brutcher Translation* no. 3854).

Stress-strain diagrams of specimens taken from disks cut from the ingots and then water quenched versus furnace cooled. Tensile and impact test data. Conclusions as to a direct relationship between temper brittleness and drop of tensile strength. (Q26s, Q27a; ST)

789-Q. (Italian.) **Correlation Between Chemical Composition, Micrographic Structure and Breaking Strength of Spheroidal Cast Irons.** C. Gianola. *Fonderia Italiana,* v. 6, Feb. 1957, p. 65-72.

Calculation of modulus of elasticity of cast irons, with particular reference to spheroidal. Influence of additions of nickel, manganese, copper, silicon, chromium on ferrite and pearlite. 4 ref. (Q21a, 2-10, 3-21; CI-r)

790-Q. (Italian.) **Influence of Iron and Zinc on Die Castings Made of G-Al Si8.5 Cu Alloy (UNI 3601).** D. Gualandi and G. Piatti. *Fonderia Italiana,* v. 6, Apr. 1957, p. 145-149.

Preparation of test pieces, radiographic and metallographic examination, mechanical tests, influence of iron on workability; 0.8-1.0% Fe improved technological characteristics of alloy, especially ease of separation from die. Same proportion of Fe resulted in slight decrease in mechanical properties. Presence of zinc did not exert any appreciable influence; therefore 0.5% Zn appears tolerable. 7 ref. (Q general, 2-10; Al, 5-11)

791-Q. (Japanese.) **Fatigue Rupture Study by Metallography.** Shigeo Yamato and K. Morikawa. *Japan Society of Mechanical Engineers, Journal,* v. 60, May 1957, p. 491-494.

Fatigue rupture study of low and high-carbon steel by microscopy. Majority of tests were made on railroad car wheels. (Q7, M27; CN)

792-Q. (Japanese.) **Fatigue Strength Data on Structural Alloy Steel.** *Japan Society of Mechanical Engineers, Journal,* v. 60, May 1957, p. 503-523.

Structural alloy steel data tabulated as follows: fatigue limit and tensile strength; stress-strain cycles. Included are nickel-chromium steel, nickel-molybdenum steel, chromium steel, chromium-molybdenum steel, aluminum - chromium - molybdenum steel, stainless steel, spring steel. (Q7a; AY, SGB-s)

793-Q. (Japanese.) **Fatigue Strength Data for Cast Steels and Cast Iron.** *Japan Society of Mechanical Engineers, Journal,* v. 60, May 1957, p. 524-531.

Tables and graphs of fatigue limit and tensile strength; stress-strain cycles and related experimental data. (Q7a, Q27a; ST, 5, CI)

794-Q. (Japanese.) **Fatigue Strength Data for Copper and Copper Alloys.** *Japan Society of Mechanical Engineers, Journal,* v. 60, May 1957, p. 533-540.

Tables and graphs of the creep, tensile strength, and stress-strain cycles of copper and copper alloys; data for plate, bar and cast copper alloys. (Q7a, Q3m, Q27a; Cu)

795-Q. (Japanese.) **Fatigue Strength of Light Alloys.** *Japan Society of Mechanical Engineers, Journal,* v. 60, May 1957, p. 541-554.

Tables and graphs of the creep, tensile strength, and stress cycles for aluminum and aluminum alloys, magnesium and magnesium alloys. (Q7a, Q3m, Q27a; Al, Mg)

796-Q. (Book.) **Fatigue Durability of Carburized Steel.** J. B. Bidwell, G. H. Robinson, W. S. Coleman, R. F. Thomson, R. L. Mattson, J. G. Roberts and M. Simpson. 1957. 123 p. American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio. $4.

Reviews literature and reports investigations on the effect of surface condition on fatigue resistance and the distribution and effect of residual stresses on fatigue durability of carburized steels. Contains three papers, abstracted separately, plus introduction by J. B. Bidwell and summary by R. F. Thomson. 45 ref. (Q7a; ST, 14-19)

R Corrosion

283-R. Corrosion Keys — Titanium (Commercially Pure). D. L. Macleary. *Chemical Processing,* v. 20, July 1957, p. 67, 69, 71, 73. (CMA)

Data presented graphically for the corrosion resistance of commercial titanium in organic acids, acetic acid or anhydride aromatic compounds, metal chlorides, aerated and unaerated mineral acids, liquid metals, sulphur, hydrogen peroxide, photographic emulsions, formaldehyde, ethanol, ammonia and gas mixtures. (R6, R7; Ti-a)

284-R. Corrosion Keys—Zirconium (Commercial Grade). W. E. Kuhn. *Chemical Processing,* v. 20, July 1957, p. 75, 77. (CMA)

Corrosion data presented graphically for commercial zirconium in HCl, H_2SO_4, H_3PO_4 and HNO_3, exposed and unexposed to air. (R6q; Zr)

285-R. Corrosion Resistance of Ductile Iron in Sea Water and Petroleum Tanker Services. Michel Paris and B. de la Bruniere. *Corrosion,* v. 13, May 1957, p. 292t-296t.

Laboratory data compare corrosion resistance of gray cast iron, steel, and ductile or nodular cast iron in sea water and various acid solutions of different concentrations; performance tests of ductile iron when used as product lines on petroleum tanker. (R4b, R6g; CI-r)

286-R. Corrosion Studies in High Temperature Water by a Hydrogen Effusion Method. M. C. Bloom, M. Krulfeld, W. A. Fraser and P. N. Vlannes. *Corrosion,* v. 13, May 1957, p. 297t-302t.

Method based on rate of hydrogen effusion from sealed containers being corroded by the aqueous solutions they contain; corrosion rate of low-carbon steel in distilled water at 600° F.; effect of pH, thermal shock, temperature rise and heat treatment of metal on corrosion rate; comparison of rates for low-carbon and stainless steels. 9 ref. (R4, 2-12, R11a)

287-R. Theoretical Studies and Laboratory Techniques in Sea Water Corrosion Testing Evaluation. F. L. LaQue. *Corrosion,* v. 13, May 1957, p. 303t-314t.

Use of sodium chloride synthetic sea water and natural sea water in tests for determining behavior of metals in sea water; data on corrosion rates of copper alloy, zinc and cold rolled steel in natural and synthetic sea waters; considers spray tests and effects of high velocity turbulence and jet impingement. Other topics include corrosion fatigue tests, crevice corrosion, galvanic potentials, polarization and cavitation erosion. 28 ref. (R4b, R11)

288-R. Study of Current Distribution in Cathodic Protection. E. E. Nelson. *Corrosion,* v. 13, May 1957, p. 315t-320t.

Theoretical analysis made of the effects of solution resistance and cathodic polarization on the current distribution in cathodic protection of metals; experimental study on distribution of current on a large sea wall cathode as affected by the magnitude of applied current and by shield around the anode; solution resistance calculation and effect of paint films on current distribution. 6 ref. (R10d)

289-R. Inhibiting Effect of Hydrofluoric Acid in Fuming Nitric Acid on Corrosion of Austenitic Chromium-Nickel Steels. Clarence E. Levoe, Daivd M. Masom and John B. Rittenhouse. *Corrosion,* v. 13, May 1957, p. 321t-328t.

Measured rate of corrosion of welded and unwelded chromium-nickel steels, Uniloy 19-9DL, 19-9DX and alloy 321 by fuming nitric acid with and without hydrogen chloride as a corrosion inhibitor; evaluated effect of heat treatment on rate; rate measurements at temperatures from 100 to 160° F. 3 ref. (R6g, R10b; SS-e)

290-R. Corrosion by Low-Pressure Geothermal Steam. T. Marshall and A. J. Hugill. *Corrosion,* v. 13, May 1957, p. 329t-337t.

Corrosion rate tests in geothermal steam contaminated with chlorides, hydrogen sulphides and carbon dioxide for a number of ferrous alloys including carbon and low-alloy steels, stainless steels and cast irons and nonferrous alloys including copper, aluminum, titanium and nickel-base alloys. 17 ref. (R4d; CN, AY, SS, CI, Cu, Al, Ti, Ni)

291-R. Testing Methods and Corrosion Control Measures for Buried Telephone Cable. Daniel R. Werner. *Corrosion,* v. 13, May 1957, p. 338t-344t.

Testing methods for determining current flow pattern between cable and soil; data used to determine probable life of cable from corrosion standpoint; economic feasibility of corrosion control measures. 6 ref. (R10d, T1b)

292-R. Evaluation of Laboratory Testing Techniques for Cooling Water Corrosion Inhibitors. NACE Technical Committee Report. *Corrosion,* v. 13, May 1957, p. 345t-346t.

Dynamic flow, spinning rod, spinning disk and static corrosion inhibitor testing techniques employed to determine the best method of testing polyphosphate and organic chromate inhibitors; results obtained compared to those from pilot plant studies. (R11, R10b, R4a)

293-R. Some Observations on Cathodic Protection Criteria. NACE Technical Committee Report. L. P. Sudrabin and F. W. Ringer. *Corrosion,* v. 13, May 1957, p. 351t-357t.

Compares cathodic protection criteria, including measurement of closure circuit flow between zinc plates and pipes; McCollum Earth current meter; pipe to reference electrode potential and apparent break in polarization curve, on a buried 240-ft. length of bare 6-in. steel pipe. 36 ref. (R10d; ST, 4-10)

294-R. Corrosion of Iron in High Temperature Water. Pt. 1. Corrosion Rate Measurements. D. L. Douglas and F. C. Zyzes. *Corrosion,* v. 13, June 1957, p. 361t-374t.

Method of measuring corrosion rate depends on analysis by mass spectrometer of the hydrogen collected in helium during corrosion period; used in measuring corrosion of Armco iron and high-purity vacuum cast iron over temperature range of 240 to 360° C.; effects of surface finish temperature and heat treatment. 39 ref. (R4a, 2-12, R11; Fe, CI)

295-R. Corrosion of Stainless Steels in Supercritical Water. W. K. Boyd and H. A. Pray. *Corrosion,* v. 13, June 1957, p. 375t-384t.

Investigation of corrosion behavior and weight change of 12 stainless steels, both hardenable and nonhardenable grades in degassed supercritical water at 800, 1000, 1350° F. and at pressure of 5000 psi. for periods up to 130 days; limited study of the effect of applied stress on corrosion resistance and behavior of stainless steels in degassed water of 1000° F. in presence of hydrogen. (R4 2-12; SS)

296-R. Some Case Histories of Stress Corrosion Cracking of Austenitic Stainless Steels Associated With Chlorides. H. R. Copson and C. F. Cheng. *Corrosion,* v. 13, June 1957, p. 397t-404t.

Presents 22 case histories of stress-corrosion cracking in types 302, 304, 316, 321 and 347 stainless steels which occur in water, steam, brines and miscellaneous solutions where chloride content was high or became concentrated; laboratory tests show increasing resistance to cracking with addition of nickel to steel alloys. 29 ref. (R1d, 2-10; SS-e)

297-R. A Corrosion Problem in Large Steam Generating Stations. T. J. Finnegan. *Corrosion,* v. 13, June 1957, p. 405t-409t.

Probable causes of internal corrosion leading to failure of boiler tubes; suggests role of black iron oxide; recommends protective measures. (R4c)

298-R. Shipboard Evaluation of Zinc Galvanic Anodes Showing the Effect of Iron, Aluminum and Cadmium on Anode Performance. E. C. Reichard and T. J. Lennox, Jr. *Corrosion,* v. 13, June 1957, p. 410t-416t.

Results of 9, 12 and 15 months performance tests on commercial size zinc galvanic anodes on five active ships and quiescent marine exposures; data on effect of small percentages of iron, aluminum and cadmium on the current output. (R10d, R4b; Zn)

299-R. Atmosphere Affects the Stress-Corrosion Failure of High Brass. C. H. Hannon. *Corrosion,* v. 13, June 1957, p. 417t-418t.

Effects of ammonia, oxygen, nitrous oxide, ozone and their mixtures on highly stressed brass test pieces. (R1d; Cu-n)

300-R. Corrosion in Scotch Marine Boilers. Pt. I. Model Boiler Tests on the Corrosion of Mild Steel Tubes in Highly Saline Waters. F. Wormwell, G. Butler and J. G. Beynon. *Institute of Marine Engineers, Transactions,* v. 69, Apr. 1957, p. 109-120.

Model boilers have been used to carry out qualitative and semiquantitative experiments on the corrosion of internally heated boiler tubes in conditions simulating those in Scotch boilers. The depth of pitting on mild steel boiler tubes in distilled water with additions of sea water increases with the density of the solution. Effect of various conditions on the depth of pitting are noted. Some evidence was obtained that small amounts of copper in the steel reduce the likelihood of deep pitting and perforation. Removal of the mill scale by grit blasting or pickling does not improve the corrosion resistance of the tubes. 11 ref. (R4b, 2-10; ST, *Cu*)

301-R. Corrosion in Scotch Marine Boilers. Pt. II. Model Boiler Tests on the Influence of the Copper Content of the Steel on the Corrosion of Tubes in Artificial Sea Water. G. Butler and H. C. K. Ison. *Institute of Marine Engineers, Transactions,* v. 69, Apr. 1957, p. 121-128.

Model boiler tests have been carried out to determine the influence of the copper content of the steel on the corrosion resistance of mild steel boiler tubes in artificial sea water. Experiments with steels containing from less than 0.01% copper to 0.20% have shown the value of copper in reducing the severity of pitting of tubes in the acid conditions that develop in the boiler when the water is not treated. 18 ref. (R4b, 2-10; ST, *Cu*)

302-R. Investigation of Mechanical Properties, Corrosion Resistance, and Oxidation Resistance of Thermenol, an Iron - Aluminum - Molybdenum Alloy. K. L. Kojola. Bureau of Ordnance, Report 5190. *U. S. Office of Technical Services,* PB 121837, Aug. 1956, 29 p.

Data were obtained on thermenol concerning its resistance to salt spray corrosion and high-temperature oxidation (relative to other materials), its mechanical properties at room and high temperatures, and its macro and microstructure. (R1h, R4b, 2-12, Q general; Fe, *Al, Mo,* SGA-h)

303-R. Corrosion Resistance of Zircaloy-2 Brazements in High-Temperature Water. J. B. McAndrew, H. Schwartzbart and R. Necheles. *Welding Journal,* v. 36, June 1957, p. 287s-290s. (CMA)

Simple brazements of Zircaloy-2 withstood corrosion in 680° F. pressurized water longer than 1200 hr. The successful test fillers included alloys such as Ni-20Pd-10Si, Ni-30Ge-13Cr, Cu-20Pd-31In, Zr-5Be and Zr-10Fe-10Cr. Notable among the failures were Zr-10Fe-10Pd and Zr-15Fe-15Mn. The effect of spacing shims was investigated. (R4a, 2-12; Zr, 7-2)

304-R. (English.) **Investigation on Acid-Resistant High-Silicon Iron. Pt. 4. Corrosion Resistance to Sulphuric Acid.** Hiroshi Sawamura, Osamu Ta-

jima and Kyoichi Akamatsu. *Kyoto University, Faculty of Engineering, Memoirs,* v. 19, no. 1, Apr. 1957, p. 92-101.

Corrosion tests were carried out on acid-resistant high-silicon iron in sulphuric acid with various concentrations and temperatures. The effects of the acid concentration, temperature and duration of test are discussed. The appearance of the surface of the specimen is also examined. 4 ref. (R6g; Fe, *Si*, SGA-g)

305-R. (French.) **Protection Against Corrosion in Industrial Plants Using Steam.** R. Malicet. *Corrosion et Anticorrosion,* v. 5, June 1957, p. 174-184.

Types of corrosion prevalent; various types of attack to which equipment is subjected; boilers, superheaters and piping; factors influencing the corrosion mechanism. (To be continued.) (R4d)

306-R. (French.) **Corrosion in the Research Program at Cebedeau.** E. Leclerc. *Corrosion et Anticorrosion,* v. 5, June 1957, p. 185-188.

Research currently in progress and projected at the Centre Belge d'Etude et de Documentation des Eaux (Cebedeau). Work is concerned with potable waters, soft waters and waters for boilers; an experimental high-pressure boiler is being built. 9 ref. (R4, Agh)

307-R. (German.) **Investigation Into Corrosion of Stainless Steel With 13% Chromium and 8% Nickel in Acids and Acid Mixtures.** Willi Machu and M. G. Fouad. *Archiv für das Eisenhüttenwesen,* v. 28, Mar. 1957, p. 157-165.

Determination of weight loss in hydrochloric, sulphuric, phosphoric acids and their mixtures; presence and absence of organic and inorganic inhibitors. 6 ref. (R6g, R10b; SS)

308-R. (German.) **Surface Corrosion Rule and Effect of Inhibitors on Electrochemical Corrosion.** H. E. Homig. *Werkstoffe und Korrosion,* v. 8, June 1957, p. 321-324.

This rule is valid under certain conditions only. These conditions can be derived from the fundamental rules of corrosion processes mathematically so that one can obtain a general law of which the classical surface rule is a special case. For anodic and cathodic controlled corrosion processes the surface rule is perfectly valid at certain ratios of the cathodic to the anodic areas, and only approximately valid at other ratios. Assuming a simplified mechanism for certain inhibitors it is possible to determine the effects of adding inhibitors from the general surface law. (R1a, R10b)

309-R. (German.) **Stress-Corrosion in Homogeneous Alloys, Characteristics and Mechanism.** L. Graf. *Werkstoffe und Korrosion,* v. 8, June 1957, p. 329-344.

The occurrence of stress-corrosion is dependent on the following conditions: characteristic susceptibility of an alloy to stress-corrosion; chemical action of a corroding agent upon the less noble constituent of the alloy; tensile stress. The most important factor influencing the susceptibility of homogeneous mixed crystals to stress corrosion cracking is the amount of the mixed crystal concentration. 25 ref. (R1d)

310-R. (Italian.) **Corrosive Action of Vanadic Anhydride on Metals at Elevated Temperatures. Pt. III.** V. Cirilli and A. Burdese. *Metallurgia Italiana,* v. 49, May 1957, p. 320-326. (CMA)

In a study of the effect of the presence of aluminum and silicon in nickel-chromium steels on their resistance to the corrosive action of V_2O_5, it was found that, while small amounts of silicon improve the resistance, the presence of aluminum produces no favorable effect. These facts are correlated with the properties of the phase diagrams of the systems V_2O_5-Al_2O_3 and V_2O_5-SiO_2. In the former system the formation of the orthovanadate $AlVO_4$ takes place, which melts incongruously at 695° C.; in the latter system no compounds of SiO_2 with V_2O_5 are formed. 12 ref. (R6p, 2-10, AY, *Ni, Cr, V*)

311-R. (Japanese.) **Studies on the Corrosion Resistance of Titanium Alloys. Pt. 3. Corrosion Resistance of Ti-Ag, Ti-Cu, Ti-Fe, Ti-Co, Ti-W and Ti-Sn Alloys.** S. Yoshida, S. Okamoto and T. Araki. *Government Mechanical Laboratory, Journal,* v. 11, May 1957, p. 87-93. (CMA)

Arc melted, hot and cold rolled specimens of a number of binary titanium alloys were tested in 25° C. and boiling test solutions. The corrosion resistance of the alloys in H_2SO_4, HCL, HNO_3, aqua regia, oxalic acid, other organic acids, $FeCl_3$ and $AlCl_3$ is shown graphically. (R6g; Ti)

312-R. (Japanese.) **Utilization of Low-Grade Titanium Sponge Produced by the Kroll Process. Pt. II. The Oxidation of Ti-Fe Alloys at Elevated Temperatures in Air.** Kazuo Hirayama, Torao Inagaki and Takeshi Takei. *Tokyo, Scientific Research Institute Reports,* v. 33, Mar. 1957, p. 58-64. (CMA)

The oxidation behavior of low-grade titanium containing up to 12% Fe (byproduct of the Kroll process) was studied between 500 and 1000° C. in air. In the vicinity of 500° C. the oxidation of the alloys was slight but increased at temperatures above 600° C. With increasing temperature, the oxidation of the alloys obeyed a simple law. With increased time (up to 36 hr.), the process progressed approximately according to the parabolic law. The iron contents of the low-grade titanium did not affect the oxidation appreciably. It was observed that the penetration of oxygen at temperatures above 800° C. was considerable. The structures of the resultant penetrated zone were investigated using microscopy, X-ray and electron diffraction. 6 ref. (R1h, 2-12; Ti, 6-24)

313-R. (Russian.) **Electrochemical Behavior of Titanium in Aqueous Solutions of Electrolytes.** Ya. M. Kolstyakin and P. S. Petrov. *Zhurnal Fizicheskoi Khimii,* v. 31, Mar. 1957, p. 659-672. (CMA)

In an electrochemical study of anticorrosive properties of titanium, hydrogen overpotential measurements were made at various current densities and pH values. The potential dependence of the reaction velocity is expressed by Tafel straight lines with slopes 0.100-0.140. While in acid solutions this velocity is proportional to the concentration of H_3O^+ ions, in alkaline solutions it is independent of the pH value. It is concluded that in the latter case H_2O molecules are the source of the liberated hydrogen. In acidified solutions of salts the nature of the reaction depends on the current density. While at low current densities the reaction is due to the discharge of H_3O^+ ions, at high current densities it is determined by the discharge of H_2O molecules. A notable activation of the surface of titanium is observed at negative potentials and at elevated concentrations of the acid. This activation also depends on the nature of the acid; it increases with acids in the order H_2SO_4, HCl, HF. 17 ref. (R6g, R11m; Ti)

314-R. Marine Cathodic Protection. A. J. Whitehead. *Corrosion Prevention & Control,* v. 4, June 1957, p. 59-60.

Description of a finned anode for installation in ballast tanks of oil tankers and in impressed current system for cases where there is no fire risk. (R10d)

315-R. Corrosion Problems in a Blast Furnace Water-Cooling System. H. B. Lloyd. *Corrosion Technology,* v. 4, July 1957, p. 221-224.

Techniques and designs employed to provide a practical solution to corrosion problems of a blast-furnace water cooling system based on soft-water supply; water cooling system, external pipework and stave coolers are discussed. (R4a, D1, 1-2)

316-R. Prevention of Corrosion by Water Treatment. T. B. Fielden. *Corrosion Technology,* v. 4, July 1957, p. 225-229.

Corrosion and its prevention in boilers and their accessories. 33 ref. (R10a, R4)

317-R. Cationic Chemicals in Steam Plant. Filming Amines Prevent Condensate Line Corrosion. D. Bass and G. G. Sindery. *Corrosion Technology,* v. 4, July 1957, p. 230-234.

Protection from oxygen and carbon dioxide attack in steam-condensate systems obtained by use of filming amines. 5 ref. (R10b, R4d)

318-R. Role of Corrosion Inhibitors in Water Treatment. E. L. Streatfield. *Corrosion Technology,* v. 4, July 1957, p. 239-244.

Anodic, cathodic and organic inhibitors with special emphasis on amines. 12 ref. (R10b, R4)

319-R. Some Unusual Effects of Hydrogen in Corrosion Reaction. J. E. Draley and W. E. Ruther. *Journal of the Electrochemical Society,* v. 104, June 1957, p. 329-333.

Where metal surface is covered with a protective layer it is considered that some hydrogen ions diffuse through the layer and form hydrogen atoms beneath, thereby decreasing corrosion resistance. Three types of harmful effects are illustrated. 18 ref. (R1; *H*)

320-R. Kinetics of the Oxidation of Chromium. Earl A. Gulbransen and Kenneth F. Andrew. *Journal of the Electrochemical Society,* v. 104, June 1957, p. 334-338.

Study of conditions under which chromium fails in oxidation. Failure occurs when a rapid reaction develops in which diffusion processes are no longer rate controlling, resulting in poor adhesion of the oxide to the metal. Studies were made from 700-1100° C. using vacuum microbalance method. 15 ref. (R1h; Cr)

321-R. Corrosion Behavior of Zirconium-Base Uranium Alloys. U. Merten and D. C. Belouin. *U. S. Atomic Energy Commission,* KAPL-1570, June 15, 1956, 25 p. (CMA)

The corrosion resistance of zirconium containing 7-8% U in 316 and 360° C. water was studied. Previous heat treatment has a large effect. The corrosion rate of

quenched specimens is increased when sponge material is used instead of crystal bar. (R4, 2-14; Zr, *U*)

322-R. Symposium on Preservation for Mobilization Requirements. Naval Civil Engineering Research and Evaluation Laboratory. *U. S. Office of Technical Services,* PB 131007, Oct. 1956, 524 p. $8.

Forty papers covering a wide range of problems in the prevention of deterioration of such materials and equipment as vehicles, construction products, metals, engines, electrical devices and rubber. Preservative materials such as Teflon, organic coatings and liquid corrosion inhibitors are also dealt with. (R10)

323-R. Oxidation of Iron Oxides. F. Lecznar. *Hutnik,* v. 23, 1956, p. 413-418. (*Henry Brutcher Translation* no. 3948).

Reasons why Fe_3O_4 oxidizes during cooling to alpha Fe_2O_3 and not to gamma Fe_2O_3. Physicochemical properties of ferrous oxide. Physicochemical properties of Fe_3O_4 and of gamma Fe_2O_3. Oxidation of limonites contaminated with silica; influence of cooling time and cooling conditions; effect of reduction temperature; conditions under which the loss of iron can be held at a minimum. (R1h, Fe)

324-R. (French.) **Protecting Metals Against Corrosion.** Pierre Orlowski. *Génie Civil,* v. 134, May 15, 1957, p. 227-231.

Summary of corrosion problems and anticorrosion techniques. Mechanism of corrosion; protective methods, including cathodic coating; paints and varnishes; sprayed-on metallic coatings, electrodeposition; testing of anti-corrosive coatings. (R general, L general)

325-R. (Japanese.) **Effect of Halogen Ions on Anodic Passivation of Stainless Steels.** Susumu Moriden and Kazutaka Sakiyama. *Electrochemical Society of Japan, Journal,* v. 25, Apr. 1957, p. 191-195.

Investigation of passivity from the viewpoint of halogen ion concentration; anodic behavior of various stainless steels and metals in alkaline and acidic solutions. 5 ref. (R10c; SS)

326-R. (Japanese.) **Corrosion of Steel With Rough Surface.** Shunsuke Shishido. *Electrochemical Society of Japan, Journal,* v. 25, Apr. 1957, p. 187-191.

Corrosion study by electron diffraction; mechanism of corrosion; effect of inhomogeneity of base metal. 4 ref. (R1, R11a; ST)

327-R. (Japanese.) **Corrosion of Iron by Alternating Current.** Yutaka Torigoe. *Electrochemical Society of Japan, Journal,* v. 25, Apr. 1957, p. 203-208.

Corrosion of iron by alternating current in acid and salt baths; relation between corrosion rate and pH. 10 ref. (R1j; Fe)

328-R. (Polish.) **Influence of Mechanical Surface Treatment of Metals and Alloys Upon Their Corrosion Resistance.** Stanislaw Mrowec and Teodor Werber. *Hutnik,* v. 24, Apr. 1957, p. 142-147.

Influence of mechanical surface treatment upon the rate of oxidation of metallic surfaces. The differences of the rate of oxidation are due to variations in structure and chemical composition of the oxidized layer. Uniform interpretation of the phenomena involved cannot as yet be presented. 15 ref. (R1h, 3-20)

329-R. (Book.) **Corrosion and Wear Handbook for Water Cooled Reactors.** D. J. De Paul, Editor. Atomic Energy Commission TID 7006, Mar. 1957, 293 p. U. S. Government Printing Office, Washington 25, D. C. $2.25.

Engineering problems resulting from use of water as a heat transfer medium in a reactor plant. Presents in one reference source corrosion and wear data resulting from the development of the Nautilus submarine reactor and the Shippingport pressurized water reactor projects. Theoretical as well as experimental data on corrosion and wear of materials in water-cooled nuclear reactors are presented.
(R4, Q9n, W11p)

Inspection and Control

351-S. Tantalum Determination in Presence of Niobium by Precipitation With N1 - Benzoyl - N - Phenylhdroxylamine. Ross W. Moshier and James E. Schwarberg. *Analytical Chemistry,* v. 29, June 1957, p. 947-951.

Procedure is given. The error in the determination is 0.2 mg. of tantalum oxide. Titanium and zirconium show negligible interference compared to columbium. 22 ref. (S11; Cb)

352-S. Volumetric Determination of Uranium. Titanous Sulfate as Reductant Before Oxidimetric Titration. James S. Wahlberg, Dwight L. Skinner and Lewis F. Rader. *Analytical Chemistry,* v. 29, June 1957, p. 954-957.

A rapid method for routine determination of uranium in uranium-rich materials. 12 ref. (S11j; U)

353-S. Determination of Aluminum in Aluminum-Iron Alloys. John V. Gilfrich. *Analytical Chemistry,* v. 29, June 1957, p. 978-980.

The present method is based on the adsorption of interfering elements by an ion exchange resin; the nonadsorbable aluminum is determined gravimetrically by precipitation with ammonium hydroxide. 11 ref. (S11g; Al, Fe)

354-S. Isotopic Method for Determining Oxygen in Chromium. A. D. Kirshenbaum. *Analytical Chemistry,* v. 29, June 1957, p. 980-981.

Isotopic method for determining oxygen in titanium, zirconium, copper and iron has been extended to the determination of oxygen in chromium with an accuracy of 99% or better. 7 ref. (S11r; Cr, *O*)

355-S. Ultrasonic Testing of Heavy Steel Products. I. M. Mackenzie and R. Kennedy. *Engineering,* v. 183, May 24, 1957, p. 652-655.

Some of the problems which are facing the steelmaker in his attempts to apply ultrasonic tests to heavy steel products. Distinguishes between harmful defects and unimportant imperfections and indicates testing methods and equipment. (S13g; ST)

356-S. Tests Titanium for Hydrogen Content. *Iron Age,* v. 180, July 18, 1957, p. 146-147. (CMA)

Glenn L. Martin Co. (Baltimore) tests Ti-8Mn sheet samples for hydrogen with a vacuum fusion gas analysis apparatus developed by National Research Corp. to meet the Air Force specification of 150 ppm; the maximum for bar and forgings is 125 ppm. An induction heating furnace to drive off the gases from the sample is part of the apparatus. A McLeod gage reads gas volume and pressure. (S11r, 1-3; Ti, *H*)

357-S. Criteria for Evaluating Electrical Resistance Alloys. C. Dean Starr. *Metal Progress,* v. 72, July 1957, p. 88-94.

Even though the "life" of Ni-Cr and Ni-Cr-Fe resistors, as measured by standard test, has been increased tenfold in the past 30 years, the industry is still improving the older standardized analyses, and seeking new varieties of Ni-Cr-Al, Fe-Cr-Al and molybdenum-base alloys for more severe services.
(S21, Q general, 2-12; SGA-q)

358-S. Tool Steels. Pt. II. Why Do Tool Steels Fail? L. F. Spencer. *Steel Processing,* v. 43, June 1957, p. 315-323, 346.

Poor-quality steel, bad designs, incorrect heat treatment, improper grinding and finishing techniques and application contribute to tool failure. (S21; TS)

359-S. Determination of Tin in Zircaloy and Uranium-Zircaloy: Colorimetric Procedure. J. L. Marley and O. J. Articolo. *U. S. Atomic Energy Commission,* KAPL-M-JLM-2. Feb. 14, 1957. 5p. (CMA)

Procedures for the separation and determination of tin in Zircaloy and uranium-Zircaloy. Tin is separated from simple Zircaloy by ion-exchange with Dowex-2-X in HCl. The tin is then eluted with H_2SO_4 solution and determined spectrophotometrically with dithiol. Tin is extracted from zirconium-uranium mixtures by means of diethylammonium-dithiocarbamate and then colorimetrically determined with dithiol. (S11, Zr, U, *Sn*)

360-S. (English.) **Determination of Microamounts of Calcium, Magnesium and Aluminium in Titanium Metal.** H. Goto and S. Takeyama. *Tohoku University Research Institutes, Science Reports, Series A,* v. 9, Apr. 1957, p. 138-146. (CMA)

The difficult separation of calcium, magnesium and aluminum from titanium metal for their determination in micro amounts was accomplished by ether extraction of titanous thiocyanate from the sample; the aqueous phase is 2N in HCl. Using H_2SO_4 gives poor results. The calcium, magnesium and aluminum in the aqueous phase were then determined by photometric procedures. (S11j, S11a; Ti, *Ca, Mg, Al*)

361-S. (English.) **Bismuthiol II as an Analytical Reagent. Pt. VII. Estimation and Separation of Silver From Precious Metals.** Anil Kumar Majumdar and Bhu Ratna Singh. *Zeitschrift für Analytische Chemie,* v. 155, Feb. 26, 1957, p. 166-168.

Bismuthiol II separates silver from osmium, iridium, ruthenium, rhodium and gold at a pH of 8 to 9 if thiosulphate is used to complex interfering ions; complexone III (disodium salt of ethylenediamine tetra acetic acid) keeps osmium, iridium, ruthenium and rhodium in solution at a pH of 5 to 9. 5 ref. (S11; Ag)

362-S. (English.) **Determination of Thorium in Magnesium Alloys That Contain Zirconium.** G. B. Larrabee and R. P. Graham. *Zeitschrift für Analytische Chemie,* v. 156, no. 4, 1957, p. 258-265. (CMA)

In an indirect polarographic method for thorium in magnesium alloys containing zirconium, the zirconium interference is removed by a prior removal with an anion exchange resin. The zirconium can be easily eluted for subsequent determination. (S11m; Mg, *Th*)

363-S. (Czech.) **Photocolorimetric Determination of Zirconium With Morin.** H. Tuma and N. Tietz. *Chemicke Listy,* v. 51, Apr. 1957, p. 722-725. (CMA)

Zirconium in iron alloys and carbides can be determined by using the yellow complexes zirconates form with morin in acid solutions. Iron, cobalt, nickel, chromium and aluminum (the latter up to certain concentrations) do not interfere with the coloring. 7 ref. (S11a; Zr)

364-S. (French.) **Magnetic Methods for the Detection of Impurities in Solids.** L. Weil. *Bulletin de l'Institut International du Froid* (International Institute of Refrigeration), Supplement, Annexe 1956-2, Sept. 1956, p. 77-82.

Importance of magnetic measurements at very low temperatures for determining impurities in solids. Paramagnetic susceptibility is higher (in the case of dissolved magnetic impurities) as the temperature is reduced; ferromagnetic fluctuations disappear. Nature of the impurities; determination of Curie points; dimension of precipitates; limits of sensitivity of magnetic methods. 6 ref. (S13h; 9-1)

365-S. (French.) **Application of Statistical Methods in the Foundry.** L. Dor. *Fonderie Belge,* no. 5, May 1957, p. 81-91.

The principles and methods underlying industrial quality control; experimental techniques; possible applications of statistical quality control in foundry operations. 6 ref. (S12, E general)

366-S. (German.) **A New Sampling Process of Liquid, Killed and Rimmed Steel for a Determination of Oxygen and Hydrogen Content.** Hermann Schenk, Karl Heinz Gerdom and Klaus-Günther Schmitz. *Archiv für das Eisenhüttenwesen,* v. 28, Mar. 1957, p. 123-125.

By the use of quartz pipettes which are evacuated to the extent of 1 x 10 Torr^{-4} and sealed with light meltable soft iron caps, the total gas content of the liquid steel is obtained. In oxygen determination it is advantageous to obtain alumina-free rimmed samples. 14 ref. (S12h, S11r, 1-3; ST, *O, H*)

367-S. (German.) **Photo-Electric Spectrometer for Testing of Steel.** Hans Diebel and Wilhelm Hanle. *Archiv für das Eisenhüttenwesen,* v. 28, Mar. 1957, p. 127-132.

Construction of a grid spectrometer; advantages of the grid for photo-electric measurements; adjustment of optical components; plotting apparatus; excitation; spark discharge; spectral lines; examples of calibration curves for steels and aluminum alloys. 22 ref. (S11k, 1-3, ST, Al)

368-S. (German.) **Practical Experiences With the New Photo-Electric Grid Spectrometer.** Fritz Thorn. *Archiv für das Eisenhüttenwesen,* v. 28, Mar. 1957, p. 133-134.

Measurements on light metal alloys; sample preparation; accuracy of analysis. (S11k, 1-3; Al, Mg)

369-S. (German.) **Development Possibilities of Photo-Electric-Emission Spectroscopic Analysis.** Hans Krempl and Günther Scheibe. *Archiv für das Eisenhüttenwesen,* v. 28, Mar. 1957, p. 135-143.

Problems with regard to spectrochemical light source, chemical processes and decomposition of materials; intensity flow of line emission; new spark producer; automatic recording device; photo-electric spectro chart. 16 ref. (S11k, 1-3)

370-S. (German.) **Application of Nondestructive Inspection Methods in Production Control.** H. Kostzewske. *Metall,* v. 11, July 1957, p. 582-586.

Nondestructive checking methods lend themselves particularly to "in production" control linked with automatic feedback devices. Gaging instruments using beta and gamma rays as applied to rolling mills are described; the principles of ultrasonic crack and flaw detectors, eddy current and magneto-inductive-type checking instruments are given. 17 ref. (S13, S14, 1-2)

371-S. (German.) **Utilization of Isotopes and Radiation Sources in the Metallurgical Industry.** A. M. Samarin. *Neue Hütte,* v. 2, Feb-Mar. 1957, p. 69-76.

Investigations on chemical reactions, blast furnace operation, casting, diffusion and metallurgical processes. 12 ref. (S general; 14-13)

372-S. (German.) **Ultrasonic Testing of Heavy Forgings.** Günter Beckmann. *Neue Hütte,* v. 2, Feb-Mar. 1957, p. 169-178.

Inspection of heavy forgings; ultrasonic and echo methods; effect of structural conditions and forging process on ultrasonic testing; determination of usability of forgings with flaws; effect of separation, metallic inclusions and micro-flaws. 9 ref. (S13g; 4-1)

373-S. (German.) **Determination of the Hafnium Content in Zirconium by Activation Analysis.** T. Stribel. *Zeitschrift für Angewandt Physik,* v. 9, June 1957, p. 293. (CMA)

A procedure for the determination of hafnium in zirconium by neutron activation, using the gamma-radiation of the 19-sec. isomer Hf^{179} produced by neutron capture in Hf^{178}. Hafnium contamination as low as 10^{-4} parts by weight can be determined with an error of $\pm 5\%$. The present limit of the method lies below 10^{-5} parts by weight, but the sensitivity could be increased still further. 2 ref. (S11q; Zr, *Hf*)

374-S. (Japanese.) **Spectrophotometric Determination of Vanadium in Steel and Iron.** S. Wakamatsu. *Japan Analyst,* v. 6, May 1957, p. 273-277. (CMA)

A spectrophotometric method for vanadium based on the yellow color developed in concentrated H_2SO_4 is described. The iron or steel sample is decomposed with $HClO_4$, the color is developed and the quantity of vanadium present is read at 390 mμ. (S11a; AY, CI, *V*)

375-S. (Japanese.) **Rapid Determination of Fe in Pure Al Foil and Al-Fe Alloy by Decomposition With Sulphuric Acid. Pt. 2. Studies on the Interference of Other Coexisting Elements.** Toyoji Ushioda, Osamu Yoshimura and Shigeo Inoue. *Light Metals,* v. 7, May 1957, p. 70-75.

Study of the interference of Ti, V, Cu, Cr and Sn. 9 ref. (S11j; Al, *Fe*, 4-6)

376-S. (Japanese.) **Determination of Trace Sodium and Nitrogen in Aluminum.** Yukio Kitano, Kazuichi Akiyama, Kichio Akiyama and Tsuyoshi Ozaki. *Light Metals,* v. 7, May 1957, p. 76-81.

Determination of sodium in aluminum by flame photometry, linear extrapolation and heat extraction; determination of nitrogen in aluminum by photometric method using Nessler's reagent. Experimental procedures and results are summarized. 12 ref. (S11a; Al; *Na, N*)

377-S. Dye Penetrant Inspection. William D. Briggs. *American Machinist,* v. 101, May 6, 1957, p. 157-159.

Steps in using dye penetrant inspection for metal parts include cleaning, applying penetrant, removing excess dye, drying parts, spraying developer and interpreting results. (S13k)

378-S. Quality Control in the Manufacture of Film Coated Magnet Wire. W. E. Bramer. *American Society for Quality Control, National Convention Transactions,* May 1957, p. 89-97.

Control techniques currently employed at John A. Roebling's Sons Corp. plant in the manufacture of high-quality magnetic wire. (S12, F28; SGA-n)

379-S. The Flame Photometric Determination of Caesium in Bismuth and Bismuth-Uranium Alloy. P. C. Wildy. *Atomic Energy Research Establishment,* C/R 2114, 1956, 11 p.

Method for determination of cesium in bismuth and bismuth-uranium alloy using an image converter flame photometer. The precision (2σ) over the range 1 to 5% cesium is better than 5% and over the range 0.20 to 1% cesium is approximately 10%. The limit of sensitivity is 0.02%. (S11a; Bi, *Cs*)

380-S. Spectrographic Determination of Mo, Be, Fe, Cr and Ni in Bismuth and Bismuth-Uranium Alloys. M. J. Owers and M. S. W. Webb. *Atomic Energy Research Establishment,* C/R 2115, 1957, 15 p.

Bismuth metal or alloys are converted to oxide, cobalt and vanadium incorporated as internal standards and 70 mgm. charges burnt to completion in cupped graphite electrodes. The resulting spectra are evaluated for Mo, Be, Fe, Cr and Ni over the range 1 to 200 ppm. by microphotometry, and, with the exception of iron, sensitivities of 1 ppm. or better are attained. At the 50-ppm. level, coefficients of variation on single spectra vary from 12% in the case of chromium down to 6% for molybdenum and nickel. 7 ref. (S11c; Bi, *U*)

381-S. Modern Trends in Metallurgical Analysis. W. T. Elwell. *Iron and Steel,* v. 30, July 1957, p. 347-353.

Spectroscopy, spectrophotometry, radioactivation, homogeneous precipitation, analysis of solid samples, analysis of titanium and its alloys. 23 ref. (S11; Ti)

382-S. Analysis of a Silver-Copper Alloy. Ogden Baine and John Banewicz. *Journal of Chemical Education,* v. 34, June 1957, p. 297-298.

Experimental procedures and equipment used in the quantitative analysis of various silver bronzing alloys with a wide range of silver and copper content. 6 ref. (S11; Ag, Cu)

383-S. Production of Ball and Roller Bearings. *Machinery,* v. 90, June 7, 1957, p. 1256-1268.

Maintenance of dimensional control by use of electronic compara-

tors, visual inspection system and grading after final finishing of balls and rollers. (S14, T7d)

384-S. Performance of Carbide Cutting Tools. *Machinery,* v. 91, July 19, 1957, p. 138-143.

Influence of speed, feed and depth of cut; tool life results; utilization of improved tool life; influence of cutting fluid. (S21, T6n; 6-19)

385-S. Some Recent Advances in the Analysis of Cast Iron and Foundry Materials. W. E. Clarke. *Metallurgia,* v. 56, July 1957, p. 47-52.

Revisions and improvements in methods of analysis by the Methods of Analysis Sub-Committee of the British Cast Iron Research Association. 19 ref. (S11; CI)

386-S. Microchemical Analysis. G. W. C. Milner and J. W. Edwards. *Metallurgical Reviews,* v. 2, no. 6, 1957, p. 109-155.

Extensive literature review contains a description of methods commonly used for analysis of metals from milligram samples; described are microvolumetric, microgravimetric, absorptiometry, polarography, electro-analysis, electrometri-titration, chromatographic and micro-analysis of gases; reviews application of these methods to analysis of the following elements found in iron and steel; carbon, sulphur, phosphorus, molybdenum, nickel, chromium, manganese, silicon, cobalt, tungsten, vanadium, titanium, copper, lead, tin, aluminum, zirconium and oxygen. Procedures for determining alloying constituents in aluminum, copper, tin, lead, zinc, nickel, and magnesium-base alloys also reviewed. 205 ref. (S11d)

387-S. X-Rays Speed Chemical Analysis. R. D. Ahles. *Modern Castings,* v. 32, July 1957, p. 45-46.

X-ray emission spectrometry offers accurate and speedy analysis for stainless steels, high-temperature alloys and other foundry alloys. (S11p; SS, SGA-h)

388-S. Characteristics of Sparks Generated by the Grinding of Metals. *Welding Engineer,* v. 42, Mid-June 1957, p. 96.

Nature and quantity of sparks produced on grinding iron and alloy steel. (S10n; AY, CI)

389-S. Spectrographic Determination of Phosphorus in Steel. H. Krempl and H. Bertam. *Archiv Eisenhüttenwesen,* v. 27, 1956, p. 303-309. *(Henry Brutcher Translation* no. 3761).

Limits of detectability of phosphorus in steel; sensitization of plates; choice of most suitable excitation; advantages of Seitner spark over Pfeilsticker interrupted arc and Feussner spark; density of P lines in four regions of spectrum as function of P concentration; recommended P line; effect of electrode shape on spectrum; volatilization of electrode; procedure for quantitative determination of phosphorus (limits of error: ±3%). (S11c; ST, *P*)

390-S. New Methods of Quality Control With Special Reference to Their Automation. Pt. 1. Electromagnetic Methods of Nondestructive Testing. F. Förster, K. Sprungmann, A. Michalski and W. Koch. *Technische Mitteilungen,* v. 50, 1957, p. 162-174. *(Henry Brutcher Translation* no. 3956).

Fundamentals of eddy-current detection of cracks in steel parts; eddy-current testing of semifinished steel; testing with magnetic leakage flux methods; crack detection by magnetography; development and automation of nondestructive testing with Magna-test-Q (Q=quality) suitable for sorting by composition, tensile strength, hardness, case depth, decarburization.
(S13h, S10, 18-24; ST)

391-S. Fractional Determination of Hydrogen in Steel. B. A. Shmelev. *Zavodskaya Laboratoriya,* v. 23, 1957, p. 263-269. *(Henry Brutcher Translation* no. 3963).

Liberation of hydrogen in various "fractions" by progressive increase in temperature of vacuum heating; various forms of apparatus for determinations by vacuum heating as opposed to vacuum fusion.
(S11r, 1-23; ST, *H*)

392-S. Determination of Finely Divided Vanadium, Molybdenum and Titanium Carbides. N. M. Popova, et al. *Zavodskaya Laboratoriya,* v. 23, 1957, p. 269-272. *(Henry Brutcher Translation* no. 3959).

Two methods of determining the finely divided fraction of V, Mo and Ti carbides in the residue left by anodic solution of drillings from steels alloyed with V, Mo or Ti. Effect of concentration of acid and time of boiling in HCL on solubility of carbides. Correlation between maximum content of fine carbides and the maximum secondary hardness on tempering of these steels. (S11j; ST, *V, Mo, Ti*)

393-S. Accelerated Method of Determining Small Amounts of Aluminum in Steel and Cast Iron. N. A. Agrinskaya. *Zavodskaya Laboratoriya,* v. 23, 1957, p. 279-280. *(Henry Brutcher Translation* no. 3960).

Colorimetric determination of aluminum in steel and cast iron with stilbazo, without prior separation of iron. Precautions to be taken with chromium-containing steels.
(S11a; ST, CI, *Al*)

394-S. (Czech.) **Photometric Determination of Titanium in Steels With the Aid of Chromotropic, Gallic and Pyrogallocarbonic Acid.** Lumir Sommer. *Chemicke Listy,* v. 51, May 1957, p. 875-879. (CMA)

The titanium content in steels even in low proportions can be determined with chromotropic acid, which forms a colored complex with titanium. The required pH value of the solution is 3.1-3.4, the wave length at which measurements are made is 470 mμ; the error does not exceed 2%. Satisfactory results can also be obtained with gallic and pyrogallocarbonic acids at pH 3.5-3.6. 18 ref. (S11a; ST, *Ti*)

395-S. (German.) **Characterization of Supersonic Readings on Steel Products.** Alfred Michalski and Hans Krächter. *Archiv für das Eisenhüttenwesen,* v. 28, Apr. 1957, p. 213-222.

Importance of factors determining the echo height; recommendations for classification of supersonic readings on tools; examples of evaluation of fluorescent screen images obtained from forgings and sheet metal; supersonic testing in a steel mill. 5 ref. (S13g; ST)

396-S. (German.) **Grinding Spark Test.** E. Drechsel. *Fertigungstechnik,* v. 7, Apr. 1957, p. 171-174.

Mechanism of the test, limitations, illustrations of many types of steels tested. (S10n; ST)

397-S. (Italian.) **Calibration of Radiographic Inspection Equipment.** Giorgio Moravia. *Rivista Italiana della Saldatura,* v. 9, Jan-Feb. 1957, p. 3-8.

Possibilities of objective evaluation of efficiency of this type of equipment. Results of a first series of experiments performed with photographic method on steel specimens of varying thicknesses. (S23, X8)

398-S. (Japanese.) **Colorimetric Analysis of Nickel in Ferro-Alloys.** To Imai and Nobumitri Nanun. *Chemical Society of Japan, Journal,* v. 60, May 1957, p. 544-546.

Volumetric determination of nickel in ferromanganese, ferrosilicon, silicomanganese and ferromolybdenum; degree of light absorption versus wave length for nickel, iron, chromium, molybdenum and manganese; in particular, the change in light absorption caused by the addition of nickel. (S11a; Fe, AD-n, *Ni)*

399-S. (Japanese.) **Spectrochemical Analysis by Waseda Univesity Apparatus. Pt. 4. Determination of Various Elements in Copper Alloys.** Kazuo Yasuda and Kiichiro Amano. *Japan Analyst,* v. 6, May 1957, p. 290-295.

Unit developed by the Casting Research Laboratory of Waseda University, Japan, for spectrochemical analysis; quantitative determination of aluminum, iron, nickel, and manganese in aluminum bronze. 3 ref. (S11k, 1-3; Cu)

400-S. (Japanese.) **Studies on Analytical Methods for Trace, Elements in Metals Using Radioactive Isotopes. Pt. 1. Determination of Zirconium in Steel.** H. Amano. *Japan Institute of Metals, Journal,* v. 21, Apr. 1957, p. 260-263. (CMA)

Tracer methods were used in evaluating various ways of determining zirconium in steel. The phosphate method was superior to the arsenate, basic selenite and mandelate methods. The separation of iron is by mercury cathode electrolysis rather than ion exchange.
(S11q; ST, *Zr*)

401-S. (Japanese.) **Methods for Determination of the Degree of Calcination of Alumina.** Ichiro Adachi and Tokiji Takahashi. *Light Metals,* v. 7, May 1957, p. 37-42.

Two methods are proposed; one obtains the degree of calcination from "hydrating-degree", which is indicated by the amount of water required for hydration, being measured by titrating free alkali with a normal solution of hydrochloric acid; the second uses the relative degree of calcination, calculated from the height-ratio d=1.395 A° and d=1.375 A° peaks in the intensity distribution curves obtained by X-ray geiger counter. 3 ref.
(S18, B15; Al, RM-n)

402-S. (Japanese. **Research on Sintered Carbide Face Milling Cutters. Pt. 1.** Makoto Okoshi and Noboru Shinozaki. *Scientific Research Institute, Reports,* v. 33, no. 3, May 1957, p. 137-154.

Cutters for super-hard alloys are usually brittle; to overcome the brittleness the shape of cutter should be properly designed; determination or durabiilty of tools; analysis of cutting methods. (S21, T6n; 6-19)

403-S. (Rumanian.) **Gravimetric Determination of Cerium and Thorium in Minerals.** Sanda Lupan. *Revista de Chimie,* v. 7, Nov. 1956, p. 661-665. (CMA)

The most suitable method for the separation of cerium and thorium

from other elements is carried out by precipitation with oxalates at a given pH. Thorium is then separated from cerium by precipitating thorium in the form of its iodate in strongly acidic solution.
(S11b; Ce, Th, RM-n)

404-S. (Rumanian.) **Use of Ion Exchangers in the Metallurgy and Analytical Chemistry of Rare Metals.** I. Il Galateanu. *Revista de Chimie,* v. 8, Jan. 1957, p. 15-19. (CMA)

The optimum conditions for the recovery of molybdenum from residues containing about 0.2-0.8 g. per l. Mo by means of a domestic ion exchange resin called anionit are investigated. The mechanism for the ion exchange reaction of molybdenum is indicated. 15 ref. (S11g; Mo)

405-S. (Russian.) **Determination of Oxygen, Hydrogen and Nitrogen in Molybdenum, Tungsten and Columbium.** G. V. Mikhailova, Z. M. Turovtseva and R. Sh. Khalitov. *Zhurnal Analiticheskoi Khimii,* v. 12, May-June 1957, p. 338-341. (CMA)

Hydrogen, oxygen and nitrogen in metallic molybdenum, tungsten and niobium, whether in dissolved state or chemically bound, can be determined by dissolving the metals in an iron bath containing carbon, whereby the fusion temperatures are lowered and oxides are reduced by carbon. At 1650° C. under vacuum all the gases are removed from the bath. 3 ref.
(S11r; Mo, W, Cb; *O, H, N*)

406-S. (Russian.) **Determination of Columbium in the Presence of Large Amounts of Titanium.** A. I. Ponomarev and A. Ya. Sheskol'skaya. *Zhurnal Analiticheskoi Khimii,* v. 12, May-June 1957, p. 355-358. (CMA)

Ascorbic acid, $C_6H_8O_6$, forms soluble complexes with titanium which remain stable when columbium is precipitated with tannin in a hydrochloric acid solution. This relationship was utilized for an accurate determination of columbium in the presence of large amounts of titanium, a situation that frequently occurs in ores and slags of titanium. 6 ref. (S11j; Ti, *Cb,* RM-n)

407-S. (Pamphlet.) **Steel Products Manual, Section 26, Revised. Stainless and Heat Resisting Steels.** 90 p. 1957. American Iron and Steel Institute, 150 E. 42nd St., New York 17, N. Y.

Manufacturing practices and product classification; chemical ranges and limits, sampling and analytical procedures; quality descriptions and restrictive requirements; properties and thermal treatment; blooms, billets and slabs; structural shapes; hot finished and cold finished bars; plates; hot rolled and cold rolled sheets; cold rolled strip; wire; mechanical properties, composition and details of working of each type.
(S22; SS, SGA-h, 15-20)

Metal Products and Parts

210-T. Aluminum Panels Pass Fire Tests. R. W. Ricker and C. R. Manley. *Ceramic Industry,* v. 70, June 1957, p. 95-97, 148.

Composite porecelain enameled aluminum panel (light-weight concrete filled) was not damaged in fire tests (1200° F. for 6 min.) simulating a minor tunnel fire. In the more severe fire test (1200° F. for 31 min.), the panels suffered no damage except a slight downward permanent deformation. The most severe fire test (1575° F. for 29 min.) indicated that this type panel would be an effective fire barrier.
(T26, 17-2, 2-12; Al)

211-T. Metals Ready for Space Vehicles. Frank LaQue. *Chemical and Engineering News,* v. 35, June 24, 1957, p. 70-72.

Heat, erosion and corrosion problems. High-temperature applications of platinum, tungsten, rhenium, molybdenum, cobalt, nickel and iron are suggested.
(T24, 17-7, 2-12; Pt. W, Re, Mo, Co, Ni, Fe)

212-T. Aluminum-Clad Copper Magnet Wire for Elevated-Temperature Use. C. L. Carlson. *Electrical Manufacturing,* v. 60, June 1957, p. 164-167.

Composite wire combines the electrical conductivity of copper with the oxidation resistance of aluminum. In the range 100 to 300° C., the loss of current-carrying ability is less than that of copper. Details of research and fabrication problems and some evaluation data for such applications as motor design are given.
(T1b, P15g, 17-7; Cu, *Al,* 8-16)

213-T. Aluminium in Electrical Engineering; Symposium on Economic and Technical Trends. *Electrical Review,* v. 161, May 24, 1957, p. 943-950.

Brief summaries of 12 papers read at a symposium arranged by the Aluminium Development Association in May 1956. Subjects include general economic considerations, physical properties of aluminum of electrical interest, aluminum in transformer construction and aluminum in the British telephone service.
(T1, 17-7; Al)

214-T. Aluminium and Electrical Engineering. *Electrical Times,* v. 132, May 23, 1957, p. 817-819.

Summarizes the papers presented and resulting discussion at a symposium held by the Aluminium Development Association in May in London. (T1, 17-7; Al)

215-T. Iron and Steel Works at Workington. *Engineer,* v. 203, May 24, 1957, p. 804-805.

Notes on equipment and methods at the plant of the Workington Iron and Steel Co., Cumberland, England, employed in the manufacture of railroad fish joints and sleeper bars. (T23, 17-7; ST)

216-T. Piston Alloys. T. O. Hunt. *Gas and Oil Power,* v. 52, May 1957, p. 122-123.

Metallurgical foundry aspects relative to the method of casting and conditions of service in oil engines with special reference to aluminum alloys having a 3.5 to 4.5% copper and a 2.5% nickel content.
(T7, 17-7; Al)

217-T. Trends in Carburetor Production. *Metal Industry,* v. 90, May 24, 1957, p. 437-440.

Illustrates complexity of Zenith VN carburetor and the advantages of zinc pressure die castings as production process for its components.
(T21b, 17-7; Zn, 5-11)

218-T. Precision Mechanisms for Telephones. *Precision Metal Molding,* v. 15, June 1957, p. 33-34.

Telephone dial governor parts made from powdered brass compact; design problems; advantages of powdered metal (copper) parts in the application. (T1, 17-7; Cu, 6-22)

219-T. Iron Powder Rings Replace Cold Rolled Steel. *Precision Metal Molding,* v. 15, June 1957, p. 44-45.

Sintered iron powder ring used as magnetic conductor in electric meters. Coining solved the "low density problem".
(T1, 17-7, G3n; Fe, 6-22)

220-T. Putting Titanium Feathers on the Firebird II. R. F. McLean. *Society of Automotive Engineers, Journal,* v. 65, June 1957, p. 28-29. (CMA)

The body of the Firebird II was made of resin-bonded titanium sheet from Republic Steel. Hand forming of the sheet was minimized because of surface cracking. Joining methods were limited to welding and resin bonding. Kirksite forms were used in the hot forming of Ti panels. Tools were preheated to 600° F., and the sheet to 920° F. The body was hand finished with abrasive blocks. The experience does not suggest titanium as an auto body material.
(T21a, 17-7, G general; Ti)

221-T. Zircaloy-2 In-Pile Tube for the NRX Central Thimble. R. M. Lieberman. *U. S. Atomic Energy Commission,* WAPD-TM-51, Apr. 1, 1957, 122 p. (CMA)

The design, fabrication and testing of the first Zircaloy-2 in-pile tube for an NRX reactor are described. The design consisted of a long piece of heavy walled Zircaloy-2 tubing closed at one end and a threaded block welded to the other; o.d. was 4.5 in. The extrusion and welding of the development and production tubes are described as are the machining and inspection processes used. Values were obtained for 70 and 650° F. for reduction in area, impact, bending, total elongation and yield and tensile strength. Results of the burst test are indicated.
(T11, 17-7, Q general; Zr)

222-T. Selected Properties of Vanadium Alloys for Reactor Application. K. F. Smith and R. J. Van Thyne. *U. S. Atomic Energy Commission,* ANL-5661, May 1957, 33 p. (CMA)

A number of vanadium-base alloys were studied for reactor application; the bulk of them were 10% Ti ternary alloys with various amounts of molybdenum, tantalum, columbium, beryllium, copper and tin. Other alloys included 2.5 Ti, 20 Ti, 5 Ti, and 1 Si. Tensile, yield and creep strengths are higher than those of stainless Type 347, except for the 1 Si alloy. The high strength would allow very thin jackets on fuel elements. Vanadium alloys are generally corrosion resistant to sodium up to 700° C. if the Na_2O content is kept down to 10 ppm., but are nonresistant to degassed water at moderately high temperatures. The thermal conductivity of the alloys is higher than that of uranium, zirconium or stainless steel. 7 ref.
(T11, 17-7, Q general, P11h, R general; V, *Ti*)

223-T. (French.) **Choice of Gear Steels and Their Heat Treatment.** O. Patterman. *Metallurgie et la Construction Mecanique,* v. 89, June 1957, p. 549-559.

Importance of the heating time and soaking of gear steels; processing diagrams; machinability; surface finish according to heat treatment; influence of the micrographic structure on machining output with carbide tools. Flame tempering. (To be continued.)
(T7a, J general; ST, 17-7)

224-T. (Japanese.) **Selection of Aluminum Alloys for Industrial Use.**

Taknichi Morinaga. *Metals,* v. 27, June 1957, p. 425-429.

Mechanical and chemical properties of aluminum alloys for the construction of buildings, bridges, ships, railroad car wheels, automobiles and chemical equipment. (T general, 17-7; Al)

225-T. (Japanese.) **Aluminum and Aluminum Alloys for Industrial Apparatus.** K. Nakayama. *Metals,* v. 27, June 1957, p. 430-437.

Types of aluminum alloys and their chemical and mechanical properties. Methods of corrosion protection against inorganic acids, ammonia, metallic chlorides, water and organic materials. Applications of aluminum alloys in the chemical industry. (T29m, 17-7; Al)

226-T. (Japanese.) **High-Silicon Aluminum Alloys for Pistons.** Tsugio Iikuma. *Metals,* v. 27, June 1957, p. 438-442.

Chemical compositions of high-silicon alloys; applications in auto industry; mechanical properties and microstructure of high-silicon alloys. 10 ref. (T21b, 17-7; Al, *Si*)

227-T. Testing of Foil-Clad Laminates for Printed Circuitry. T. D. Schlabach, E. E. Wright, A. P. Broyer and D. K. Rider. *ASTM Bulletin,* no. 222, May 1957, p. 25-30.

Utilization and applications of copper-clad laminates with special reference to printed circuitry; testing methods for evaluating the base laminate itself. (T1c, 17-7; Cu)

228-T. Material Requirements of the Australian Aircraft Industry. H. E. Arblaster. *Australasian Engineer,* no. 47, Apr. 8, 1957, p. 53-61.

Physical and mechanical properties of aluminum-base, nickel-base and copper-base alloys in the aircraft industry. 31 ref. (T24, 17-7; Al, Ni, Cu)

229-T. Metallurgical Control in Cutting Tool Manufacture. J. G. Ritchie. *Australasian Engineer,* no. 47, Apr. 8, 1957, p. 62-70.

Principal materials used for cutting tools and their properties; principles involved in the heat treatment of high-speed steel. The quality requirements in steels for tool manufacture, with examples of the results of defects in material and production. Method of testing. 9 ref. (T6n, 17-7, J general; TS)

230-T. Supersonic Speeds Need Steel. T. M. Rohan. *Iron Age,* v. 180, July 25, 1957, p. 70-71.

Steel, particularly stainless, has a growing future as planes fly higher and faster. (T24, 17-7; ST, SS)

231-T. Role of Stainless Tubing in Atomics. Norman D. Groves. *Steel,* v. 140, May 20, 1957, p. 143-144.

Austenitic stainless steels for use in atomic applications must resist severe corrosion; technique of assembling and testing to insure service. (T11, 17-7; SS, 4-10)

232-T. Missile Design Spurs Titanium's Growth. *Steel,* v. 141, July 29, 1957, p. 148-150, 152. (CMA)

Titanium represents a solution to high-temperature problems occurring in missiles operating between Mach 2-4. Weight savings are exemplified by a fitting which was redesigned for titanium, saving 20 lb. in itself and 170 lb. in the missile. Intricate forgings are costly, but the solution has been found in welded or fastened assemblies. Extrusions combined with sheets, rivets and welds offer a detour around the shortcomings of titanium. (T24e, 17-7; Ti)

233-T. Development of Zircaloy-Clad, Discrete Burnable Poison Elements for S3g/S4G. G. F. McKittrick and W. A. Neisz. *U. S. Atomic Energy Commission,* KAPL-1726, June 15, 1957, 29 p. (CMA)

The design of the S3G/S4G reactor indicates the desirability of using discrete burnable poison element rather than a dispersed poison. Zircaloy-2 was selected as the core matrix and the cladding material for the boron poison. Experimental results show that bonded-type Zircaloy-2 clad elements were inadequate for the purpose named. (T11, 17-7; Zr, 8-16)

234-T. (French.) **Portable Gasoline Stoves.** *Cuivre Laitons Alliages,* no. 37, May-June 1957, p. 17-18.

The use of brass in the manufacture of gasoline stoves. Deep drawing of the fuel tank; setting and soldering of the machine parts; automatic polishing of the tanks; assembling of the burner. (T10, G4, K7, L10; Cu-n, 17-7)

235-T. (French.) **Ventilating Hoods Made of Copper.** *Cuivre Laitons Alliages,* no. 37, May-June 1957, p. 35-37.

Use in the home, combining utility and elegant appearance. Simple copper sheet, 8-mm. thick, is employed. (T10; Cu, 17-7)

236-T. (French.) **Copper and Copper Alloys in High-Tension Electric Installations.** *Cuivre Laitons Alliages,* no. 37, May-June 1957, p. 21-26.

Excellent mechanical properties of copper makes for extensive use. (T1; Cu, 17-7)

237-T. (German.) **20-Year-Old Aluminum Roof in the Black Forest.** K. A. Heine. *Aluminium,* v. 33, July 1957, p. 456-457.

The roof, (8550 sq.ft. in area), laid in 1935 on a clock factory at Villingen, was revealed in an inspection this year to be completely intact and free from corrosion. A total of 375,000 sq. ft. of aluminum roofing has been laid in the Black Forest and no reports on vibrational cracks or fatigue phenomena have been made. (T26n; Al, 17-7)

238-T. (German.) **Aluminum Roofing Over Railway Platforms.** M. Schiller. *Aluminium,* v. 33, July 1957, p. 457-458.

Over the platforms at the Gare d'Austerlitz in Paris, umbrella-like aluminum roofs have been mounted on a steel structure of supports and cross orders. (T26n; Al, 17-7)

239-T. (German.) **Some Examples of the Performance of Aluminum in Building Practice.** W. Papsdorf. *Aluminium,* v. 33, July 1957, p. 461-464.

Examples include roofs, window and door structures, balustrades, facings and nameplates. (T26n; Al, 17-7)

240-T. (German.) **Considerations in the Building of Aluminum Bridges.** C. Marsh. *Aluminium,* v. 33, July 1957, p. 465-469.

The favorable strength-weight ratio for aluminum can save such a considerable amount of metal in bridges, where the permanent load is a considerable proportion of the total load, that the actual material costs fall below those for steel bridges. Properties of alloys suitable for bridge building; discussion of movable bridges, such as bascule bridges, swing bridges, in which the weight saving through use of aluminum naturally brings special advantages. (T26p; Al, 17-7)

241-T. (German.) **Influence of Welding Engineering on Steel Construction With Regard to Hollow Sections.** A. Dörnen. *Schweissen und Schneiden,* v. 9, June 1957, p. 235-238.

Use of hollow sections in structural work is advantageous both from the point of view of strength and resistance to corrosion. The comparison between riveted and welded, open and closed steel sections shows that the closed section scores with regard to manufacture, weight and area to be painted. The welded beam girder with hollow-section ties and struts is very economical. (T26, 7-1)

242-T. (German.) **The Bridge in Speyer: First Welded Plate Girder Bridge Over the Rhine.** W. Eichenmüller. *Schweissen und Schnieden,* v. 9, June 1957, p. 239-241.

The bridge at Speyer is the first fully welded Rhine bridge, in which only some joints for assembly on site are riveted. The use of welding is advantageous in that smooth surfaces on the main girders can be achieved without the interruptions of cross or longitudinal stiffeners. (T26p, 7-1)

243-T. (German.) **Welded High Pressure Gas Holder.** Aug. Klönne. *Schweissen und Schneiden,* v. 9, June 1957, p. 242-244.

The wall thickness of the spherical gas holder is 1.1 in. Welding operations were carried out with basic electrodes and all welds were inspected radiographically. The efficiency coefficient of the welds was increased from 0.8 to 0.9 by means of a low-temperature stress-relieving heat treatment resulting in an increase of the permissible working pressure and, therefore, of the capacity of the spherical gas holder. (T26q, 7-1)

244-T. (German.) **The Large Exhibition Hall on the Killesberg in Stuttgart as an Example of the Ever-Increasing Importance of Welding in Structural Steel Work.** Walter Wrycza. *Schweissen und Schneiden,* v. 9, June 1957, p. 245-247.

The lattice frames of 57.5 to 72.5-m. span are fully welded as are also the roof trusses which are built as arched fully welded R-beams with a span of 12.5 m. The influence of welding upon structural steel work is noted. (T26n, 7-1)

245-T. (German.) **Low-Depth Lateral Transfer Platform in Welded Construction.** H. Sattler. *Schweissen und Schneiden,* v. 9, June 1957, p. 262-263.

The increasing exploitation of the permissible over-all dimensions for railway engines and rolling stock necessitates new ideas in the design of lateral transfer platforms. Such a platform has been designed as a beam grid construction. The longitudinal and transverse beams are completely welded and are of hollow box sections having high torsional stiffness. A longitudinal joint between the tracks is made either by a novel interlocking device between the transverse beams or by welding. (T23s, 7-1)

246-T. (German.) **Welding in Docks and Harbor Engineering.** K. Trümner. *Schweissen und Schneiden,* v. 9, June 1957, p. 270-271.

Attractive waterway structures

can be produced economically with little preparatory work. The relatively high dimensional accuracies required in these structures do not create manufacturing difficulties. The wide use of welding in docks and harbor engineering is shown, and the more important manufacturing considerations discussed. (T22k, 7-1; ST)

247-T. (German.) **Some Typical Welded Designs in Boiler Construction.** E. Jahn. *Schweissen und Schneiden,* v. 9, June 1957, p. 292-294.

Importance of selection of weldable materials and welding technique in boiler construction. (T26q, 7-1)

248-T. (German.) **Automatic Welding of Alloy Steels in the Manufacture of Equipment for the Chemical Industry.** Herbert Dahms. *Schweissen und Schneiden,* v. 9, June 1957, p. 295-296.

Reactors for fuel refineries are made of sheet steel (13 Cr and 44 Mo). These reactors have a working pressure of about 50 kg. per sq. cm. and a working temperature of 510° C. The steel plates are up to 55 mm. thick. In order to obtain the conditions under which an efficiency factor of 0.9 to 1 is permissible for submerged arc welded joints certain basic requirements must be fulfilled. Multi-run welds are used and the root is gouged out. (T29n, K1e, AY, 7-1)

249-T. (German.) **Trends in the Development of Welding in Automobile and Truck Manufacture.** O. Gengenbach. *Schweissen und Schneiden,* v. 9, June 1957, p. 307-309.

Welding has to be applied in the manufacturing program in accordance with the flow of production, for example, by the use of heavy welding machines or of special welding fixtures in the power press lines. By reducing handling times and by changing from electric arc or flash butt welding to multi-spot or projection welding, efficiency can be improved. (T21a, K3)

250-T. (German.) **Welded Swivelling Bogies for Railway Rolling Stock of Light-Weight Construction.** W. Marfels. *Schweissen und Schneiden,* v. 9, June 1957, p. 315-317.

While riveted construction requires the use of open profiles, welded construction makes it possible to use torsionally stiff box sections. For a modern welded bogie for a railway coach, savings in weight of about 50% for the frame and the cradle can be achieved. Modern flame cutting methods are accurate and produce high-quality cuts. (T23p, 7-1)

251-T. (German.) **Examples of Welded Consumer Goods.** W. Brunst. *Schweissen und Schneiden,* v. 9, June 1957, p. 329-332.

When welding processes are chosen care must be taken that labor costs are low and rates of machine exploitation high. The possibility of automation must also be considered. These three features are found in resistance welding and gas-shielded fusion welding processes which are therefore most suitable for the manufacture of the products in question. They are applied in the manufacture of refrigerators, electric cookers and washing machines. 6 ref. (T10, K1, K3; 7-1)

W Plant Equipment

283-W **Core Oil "Oxidation".** Victor Rowell. *Foundry,* v. 85, July 1957, p. 104-105.

Tests indicate that new core oil with synthetic resin develops strength even in the absence of oxygen. (W19g, 1-2, NM-h)

284-W. **Application of Eddy-Current Adjustable Drives in the Steel Industry.** Thomas Skarakis. *Iron and Steel Engineer,* v. 34, May 1957, p. 95-98.

Principles, efficiency, control and application to rolling, forming and slitting mills of eddy-current couplings used in connection with squirrel cage or synchronous motors to provide wide range of stepless adjustable speed and torques. (W23n, 1-2)

285-W. **Plastic Refractory in Slab Heating Furnaces.** Robert A. Smith. *Iron and Steel Engineer,* v. 34, May 1957, p. 99-103.

Installation and experiences with plastic refractory roof and walls in strip mill heating furnace. (W20h, 1-2; RM-h)

286-W. **Preset Screwdown Control of Reversing Rougher at Granite City Steel Co.** A. W. Schlechte and C. Allan Schurr. *Iron and Steel Engineer,* v. 34, May 1957, p. 109-116.

Integrated automatic controls on four-high reversing-roughing mill include automatic preset screwdown controls for horizontal rolls and for vertical edger rolls and automatic short-travel limit switches for front and back side guides. (W23a, X20, 1-2; ST)

287-W. **Gas Firing for Furnaces.** A. Higgs. *Metal Industry,* v. 90, April 26, 1957, p. 332-334.

British users of producers gas and fuel oil find that conversion of annealing furnaces and billet heating furnaces to use of commercial gas is economical. (W27g; 1-2)

288-W. **Moving Foundry Materials. Pt. 2. Pneumatic Conveyors: Pipeline for Sand Handling.** *Modern Castings,* v. 31, June 1957, p. 49-51.

Pneumatic conveyors require minimum of space, reduce dust problems and move large amount of bulk material economically; essentials of pneumatic systems; installations for handling core and molding sand. (W12r, W19h, 1-21)

289-W. **Vacuum Heat Treating Takes Hold.** R. R. Giler. *Steel,* v. 141, July 15, 1957, p. 108-110. (CMA)

The titanium and aircraft industries are the chief users of vacuum heat treatments for degassing and stress-relieving. Many batch-type vacuum furnaces are in use and a semi-continuous design is being proposed. The problem in continuous units is the operation and maintenance of inner valves. To cool a load to room temperature a flood of argon is circulated by a fan. With titanium a fan is not needed because it can be exposed to air at 800° F. (W27, 1-23)

290-W. (German.) **A Progress Report on Recuperator Design.** Gert Wellensiek. *Giesserei,* v. 44, Apr. 25, 1957, p. 245-247.

Thermal conditions for the operation of recuperators; description of design with radiation and convection sections assembled in one structural unit; thermal and operational advantages of this new design over conventional recuperator systems for use with hot blast cupola furnace. (W18d, 1-2, 17-1)

291-W. (German.) **A New Method for the Manufacture of Pattern Plates for Machine Molded Castings.** Heinrich Ropat. *Giessereitechnik,* v. 3, May 1957, p. 103-105.

A method based on models which are split or plain on one side, offering a contact area. (W19j, 1-2)

292-W. (German.) **Some Comparisons Between Induction Melting Furnaces for Nonferrous Metals With and Without Gutters.** O. Junker. *Metall,* v. 11, Jan. 1957, p. 37-39.

Disregarding higher current usage, the induction furnace without gutter has the advantage of greater safety of operation and of ease in lining. In melting aluminum and its alloys gutter cleaning can be omitted. It is also very suitable for copper, nickel and their alloys. 2 ref. (W18a, 1-2; Al, Cu, Ni)

293-W. (German.) **Blast Furnace Operation With and Without Cooling Boxes.** Georg von Struve. *Neue Hütte,* v. 2, Feb-Mar. 1957, p. 138-142.

Blast furnaces equipped with external drip coolers or with plate cooling were found to be most efficient. Thinwall construction of blast furnaces is recommended. 4 ref. (W17g, 1-2; Fe)

294-W. (German.) **Application of Basic Brick Work in Openhearth Furnaces.** Karl Leitner. *Neue Hütte,* v. 2, Feb-Mar. 1957, p. 142-154.

Relation of productivity to type of refractory and type of construction; roof problems; cause of brick wear; internally reinforced bricks; Radentheimer roofs. 7 ref. (W18r, 1-2; RM-h)

295-W. (German.) **Measuring and Regulating Operations in Industrial Furnaces According to a Selected Example.** Karl Reinhard. *Werkstatt und Betrieb,* v. 90, Apr. 1957, p. 233-238.

Measuring and regulating methods in industrial furnaces are described using as an example a continuous tempering furnace for the processing of sheet metal. The measurements and regulation of temperature, control of fuel, pressure regulation of air and fuel, chamber pressure regulation and recuperator regulation are treated. (W27, X9, X12, 1-2)

296-W. (German.) **Some Special Types of Industrial Furnaces.** Reinhold Schlimm. *Werkstatt und Betrieb,* v. 90, Apr. 1957, p. 241-244.

Modern furnace installations for soft annealing and the interior varnish baking of aluminum tubes; continuous annealing furnaces for gold foil metal bands; annealing furnaces having inclined double drums for annealing mass-produced small parts in an inert gas. (W27, J23, 1-2)

297-W. (German.) **High-Duty Electrodes.** K. L. Zeyen. *Werkstatt und Betrieb,* v. 90, June 1957, p. 341-349.

Reviews the present state of development of high-duty electrodes; discusses output, current-carrying capacity and welding efficiency. (W29h, 1-2)

298-W. (Japanese.) **Investigation of Sand Molds; Effect of Mold Coating.** Goro Ohira and Mahito Koizumi. *Casting Institute of Japan, Journal,* v. 29, May 1957, p. 342-348.

The thermal behavior of mold coating investigated by differential thermal analysis. Graphite and silica coatings were examined together with alumina, metallic silicon, aluminum and mica. Comparative analysis of results. (W19g, 1-2)

299-W. (Japanese.) **Life of Large Ingot Molds Made of Ductile Cast Iron.** Tetsuo Kitashima and Tadanobu Kono. *Iron and Steel Institute of Japan, Journal,* v. 43, Apr. 1957, p. 437-444.

Experiments were made on large ingot molds, C-61 type-(weight: 5,230 kg., wall thickness: 130 mm.) and C-56 type-(weight: 4,900 kg., wall thickness: 125 mm.) used at Yawata Iron and Steel Works, for the purpose of comparing ductile cast iron with ordinary cast iron. Results showed that the ductile cast iron mold had a longer life. On the other hand some peculiar defects appeared on this inner surface in the course of ingot making. Surface crazing and cracking and changes in microstructure are discussed. 4 ref. (W19c, 17-7; CI-r)

300-W. (Japanese.) **Study on Charcoal Pig Iron for Chilled Iron Rolls. Pt. 1. Structural Characteristics and Gas Content.** Kokichi Otani. *Iron and Steel Institute of Japan, Journal,* v. 43, Apr. 1957, p. 444-450.

Charcoal pig iron is supposed to possess a better suitability for producing chilled iron rolls than other pig irons such as coke pig iron, electric pig iron and remelted pig iron. Three laboratories in Japan (Mechanical Laboratory of Japanese Government, Metal Research Institute of Tohoku University, Laboratory of Mitsubishi Kozai Co. Ltd.) have carried out gas analyses of these four types and it was found that little difference existed. 24 ref. (W23k, 17-7, N15d; CI-a)

301-W. (Polish.) **Blast Furnace Charging.** Zygmunt Krotkiewski. *Hutnik,* v. 24, Jan. 1957, p. 1-10.

Charging equipment now in operation which enables a uniform distribution of the gas passage through the charge; Tesch experiments and charging equipment; results of small-scale experiments with new design. (W12b, W17g, 1-2; Fe)

302-W. (Polish.) **Blast Furnace Throat Locking Distributing Device.** Zygmunt Krotkiewski. *Hutnik,* v. 24, Feb. 1957, p. 47-51.

Description of Brown, Becker and McKee distributing devices; an improved design is described. (W17g, 1-2)

303-W. (Polish.) **Metallic Recuperators.** Aleksander Stojek. *Hutnik,* v. 24, Feb. 1957, p. 58-61.

Progress in metallic recuperator design; means of lowering temperature of the heat exchange unit walls; construction and installation of heat exchange units; metallic recuperators as safety devices against overheating and burning. (W17, W18, 1-2)

304-W. (Russian.) **Mold Drying by Infrared Rays.** E. P. Polishuk. *Liteinoe Proizvodstvo,* no. 2, Feb. 1957, p. 1.

An apparatus fitted with infra-red electric lamps for sand mold drying. (W19k, 1-2)

305-W. (Russian.) **Shot Blast Cleaning Table-Model 353.** D. M. Litvin and L. L. Koblentz. *Liteinoe Proizvodstvo,* no. 2, Feb. 1957, p. 9-11.

Difficulties of efficient casting cleaning. Characteristics of five shot blast cleaning machines; the details of model 353, together with the diagrams. (W2r, 1-2)

306-W. Some Metallurgical Aspects of a Gas Turbine Engine. S. Heslop. *Birmingham Metallurgical Society, Journal,* v. 37, June 1957, p. 497-523.

Use of gas turbine engines in airplanes, automobiles and for electrical power generation; compressor units, axial turbines, turbine nozzle and heat exchanger units are considered in relation to metallurgical and manufacturing requirements due to high temperature and to high stress conditions found in engine operations. 9 ref. (W11m, 17-7; SGA-h)

307-W. The Mains Frequency Coreless Induction Melting Furnace. *Castings,* v. 3, Apr. 1957, p. 7-15.

Brief outline of design and manufacture. Discussion of channel vs. coreless type. (W18a, 1-2)

308-W. Britain's First Mains Frequency Coreless Induction Melting Furnace. *Combustion,* v. 29, May 1957, p. 227-229.

Basic principles, installation layout, furnace design and details of operation of a 300-kw., 5-ton capacity furnace. (W18a, 1-2)

309-W. Rotary Hearth Furnaces Geared for Automation in Shell Production Line. Arthur Q. Smith. *Industrial Heating,* v. 24, June 1957, p. 1128-1142.

Furnaces in production line for 155-mm. shells from billets of 1040 steel; furnaces include 20-ft. diameter rotary-hearth gas-fired forging furnace, furnace for heating shell noses, 17-ft. rotary gas-fired hardening furnace, 20-ft. rotary draw furnaces. (W27g, 1-2, T2j; CN)

310-W. High-Quality Copper Tube Redrawing Requires Precise Heating and Rigid Process Control. V. Peterson. *Industrial Heating,* v. 24, June 1957, p. 1146-1158.

Furnace units and their control including continuous gas-fired screw conveyor furnace for heating billets before piercing; direct gas-fired roller hearth furnace for continuously annealing tubing after initial drying operations, and radiant tube heated controlled DX generated gas atmosphere roller hearth furnace for finished annealing. (W27g, 1-2; Cu, 4-10)

311-W. New Furnace Heats to 6000° F.—in Minutes. P. M. Unterweiser. *Iron Age,* v. 179, June 20, 1957, p. 98-99.

Resistance-type furnace designed in Germany operates from standard 220-volt power source. Melts pure tungsten in less than 5 min. (W18, 1-2; W)

312-W. New Furnaces Treat Giant Forgings and Extrusions. R. R. LaPelle. *Iron Age,* v. 180, July 11, 1957, p. 106-107.

Large car-type furnaces at Harvey Aluminum have loading area 15 by 30 ft. with 7-ft. height and loading capacity of 225,000 lb. Heat treating furnace handles 80-ft. extrusions; height over 106 ft. above floor level; quench pit 110 ft. below floor level. (W27, 1-2; Al, 4-1, 4-8)

313-W. Structure of Ingot Moulds. *Iron and Coal Trade Review,* v. 174, May 24, 1957, p. 1205-1206.

Ingot molds, normally made from hematite cast iron are subjected to severe heating and cooling during service which may significantly alter the microstructure. Tests were made on molds from a number of different works, the majority being in the 4 to 5-ton capacity range, but additional information was available on molds of up to 15-tons capacity. Structure examination was made before and after service. 5 ref. (W19c, 17-7, M27; CI)

314-W. Experimental Results With Hollow Electrodes in Electric Steel Furnaces. W. E. Schwabe. *Iron and Steel Engineer,* v. 34, June 1957, p. 84-91.

Hollow electrodes offer certain advantages during meltdown, such as steadier arc, higher and more uniform level of useful power, but at a higher consumption rate and consequently higher electrode costs per ton of steel. (W18s, 1-2; ST)

315-W. Economics of Oxygen Generating Stations for Steel Mill High and Low-Purity Oxygen Applications. Arthur E. Steele and Donald E. Cummings. *Iron and Steel Engineer,* v. 34, June 1957, p. 114-124.

Low-cost oxygen from generating stations renders obsolete the practice of buying from a distributor. Costs for oxygen will run from $5 per ton to $26 per ton depending on demand, purity and continuity of operations. (W18g, 1-2, 17-3)

316-W. Design and Construction of Fontana Open Hearth Precipitators. E. V. Akerlow. *Iron and Steel Engineer,* v. 34, June 1957, p. 131-138.

Experience with cleaning open-hearth gases at Kaiser indicates that best results are obtained with special collecting and discharge electrodes, selenium instead of mechanical rectifiers, specially developed gas distribution apparatus and the use of wrapping mechanism. (W17n, 1-2)

317-W. Method of Testing Open Hearth Precipitators. J. H. Smith and G. L. Rounds. *Iron and Steel Engineer,* v. 34, June 1957, p. 139-141.

To determine true cleaning efficiency of precipitators continuous sampling methods were required; a dry method of cleaning probes was necessary. It was found that the "ashed" method of weighing thimbles is more convenient. Flows and velocities were calculated by computing machines. (W17n, 1-4)

318-W. Automatic Gage Control for Cold Reduction Mills. R. A. Phillips and H. S. Maxwell. *Iron and Steel Engineer,* v. 34, June 1957, p. 149-158.

Operation of various types of cold reduction mills to explain how and why automatic gage control systems differ for various types of mills. 5 ref. (W23f, X20c, 1-2)

319-W. Basic Hot Blast Cupola as Source of Hot Metal for Steel Plants. E. S. Harman and Siegfred Tunder. *Iron and Steel Engineer,* v. 34, June 1957, p. 159-166.

Operation, effect upon openhearth production rates, economics of installation and operation. (W18d, 1-2, D2; ST)

320-W. Solar Furnace for Research in Nonferrous Metallurgy. W. Marvin Tuddenham. *Journal of Solar Energy Science and Engineering,* v. 1, Apr.-July 1957, p. 48-51.

The installation and its characteristics; projected uses include: (1) to develop techniques for improved copper recovery from ores; (2) to improve the quality of refined copper. (W18, 16-13; Cu)

321-W. Solar Furnace Research in Non-Ferrous Metallurgy. W. Marvin Tuddenham. *Mines Magazine,* v. 47, Mar. 1957, p. 109-111.

Design, construction and features of a solar furnace. Experiments show that it is possible to melt columbium (melting point 4532° F.), but not rhenium (melting point 6224° F.) (W18, 16-13; Cb)

322-W. (German.) **New Developments in Furnace Construction for Drop Forgings.** E. Pflaume. *Fertigungstechnik,* v. 7, Feb. 1957, p. 63-64.

Increased use of pusher and gravity discharge furnaces; utility of rotary furnaces; increase of oil firing for economic and pyrometric reasons. 2 ref. (W20h, 1-2, F22n)

323-W. (German.) **Casting Molds, Core Boxes and Patterns of Synthetic Resins.** E. Erdmann. *Giesserei Praxis,* v. 75, June 10, 1957, p. 232-234.

Advantages and disadvantages in the use of synthetic resins for casting molds and core boxes, construction of such molds and boxes, detailed working procedures. (W19g; NM-d)

324-W. (German.) **Economic Superiority of Welded Light-Weight Construction in Modern Crane Manufacture.** Willi Wellnitz. *Schweissen und Schneiden,* v. 9, June 1957, p. 253-257.

Satisfies the requirements of port authorities and crane users with respect to low wheel pressure, cost of maintenance and better performance. (W12r, 7-1)

325-W. (German.) **Modern Welded Designs in Conveyor Equipment.** H. Bückreiss and Th. Schaaf. *Schweissen und Schneiden,* v. 9, June 1957, p. 257-260.

Dynamically stressed conveyor plants are more and more of welded construction. With the help of three examples of conveyor equipment—a sloping conveyor for a blast furnace, a loading bridge and a new type of jib support for rope conveyor across the Rhine, the following important points are described; design from the point of view of architectural appearance; maintenance; weight; manufacturing cost; cost of erection. (W12r, 7-1)

326-W. (German.) **Crab in Welded Construction for a Foundry Crane to Lift up to 160 Tons, With a Gear Box Designed as a Load-Carrying Component.** H. Andres. *Schweissen und Schneiden,* v. 9, June 1957, p. 261-262.

The welded steel frame and the welded gear box form a load carrying unit of low over-all height and pleasing appearance. All bearing supports are welded to the main frame and bored after welding. (W12q, 7-1)

327-W. (German.) **Welded Heavy Gear for Cargo Loading.** M. Komers and J. Menneng. *Schweissen und Schneiden,* v. 9, June 1957, p. 264-265.

Until recently light loading gear has been produced from seamless or welded tube up to 400 mm. diameter. For heavy loading gear, which is welded without exception, diameters up to 2240 mm. and wall thicknesses up to 70 mm. are now used. (W12q, 7-1)

328-W. (German.) **Welded Machine Tools for Cutting Sheets.** Ludwig Erlinghagen. *Schweissen und Schneiden,* v. 9, June 1957, p. 274-275.

Welding is becoming increasingly important in the manufacture of machine tools. Examples include welded machine tools for cutting long sheets. Rotary shears can be used for straight and inclined cuts. Lengths of cutting up to 15 m. are possible. (W24m, 17-7; 7-1)

329-W. (German.) **Large Size Crushing Equipment in Welded Construction.** H. Rühl. *Schweissen und Schneiden,* v. 9, June 1957, p. 276.

For the preliminary breaking of 1100 × 1800 × 1000-mm. pieces in stone quarries, large-size or single-arm crushers are used. Material is broken down to pieces of 250-mm. edge length. Cast construction had various disadvantages and a welded design has been developed. The welded machine is 20% lighter than the cast one, and because of various design features possesses important advantages over the cast steel construction. (W28, 17-7; ST, 17-1)

330-W. (German.) **Influence of Welding in the Design of Steelworks Plant.** O. Wilmes. *Schweissen und Schneiden,* v. 9, June 1957, p. 284-286.

Welded converters are 20% cheaper than riveted ones, possess perfect tightness and can easily be repaired by welding. Welding is also applied to the manufacture of rolling mill equipment where brackets, supports, etc., can be welded onto the roll frames if necessary, thus reducing their manufacturing cost. (W10, W18, W23, 7-1)

331-W. (German.) **Influence of Welding on the Manufacture of Heavy Machinery and Presses.** Hanns Ginzler. *Schweissen und Schneiden,* v. 9, June 1957, p. 286-289.

The advantages of welded steel design in the construction of steel rolling machinery and presses can be fully exploited even under very difficult conditions in that welded construction reduces manufacturing cost. The designs show a pleasing and suitable appearance and the structural weight is usually reduced. (W23, W24g; ST, 7-1)

332-W. (German.) **Welded Hydraulic Presses.** C. Hüttenes. *Schweissen und Schneiden,* v. 9, June 1957, p. 290-292.

Design, operation, economic advantages and use of welded construction. (W24g, 17-7, 1-7)

333-W. (German.) **Progress of Welding in Diesel Engine Manufacture.** Fritz Schmidt. *Schweissen und Schneiden,* v. 9, June 1957, p. 310-312.

Parts of the frames for very large engines have been welded, as well as many other components such as housings, starter bottles, exhaust silencers. Full success has been encountered in welding steel castings to plates. In spite of the heavy loading conditions in marine engines, no cracks were experienced in the large weldments. All important weldments are stress relieved. For the welding of exhaust turbines special welding procedures are employed such as preheating to a precise temperature, the use of special electrodes and sometimes argon-arc welding. (W11j, 7-1)

334-W. (German.) **Welding in the Manufacture of Electrical Machinery.** Hermann Oschanitzky. *Schweissen und Schneiden,* v. 9, June 1957, p. 324-328.

The frames of medium and large-size electrical machines are now welded almost without exception and welding has also been introduced more and more in the manufacture of smaller machines. Supporting structures for hydro-electric power plant as well as covers, bed plates, etc., are also constructed by welding. Apart from the stationary components of electrical machines rotors are often fabricated. Cast steel parts are frequently welded to steel plate components. The use of flame cutting and spot welding has also reduced the cost of manufacture. (W11q, 7-1)

335-W. (German.) **Results of Conversion of Heating Furnaces to Fuel-Oil Firing.** Karl Wilhelm Dockhorn. *Stahl und Eisen,* v. 77, July 11, 1957, p. 933-939.

Use of fuel-oil caused by the increasing cost of conveying, pulverizing and gasification of solid fuels; storage and supply plants; power required for heating and pumping the oil; modification of the boiler; pusher-type furnace and forging furnaces; burners; method of operation; heat consumption; utilization of the waste gases by means of recuperators; economic efficiency of fuel-oil firing. (W10, A1le; RM-k30)

336-W. (Italian.) **Melting Equipment.** M. Olivo. *Fonderia Italiana,* v. 6, Feb. 1957, p. 49-53.

Cold and hot blast cupolas and their linings; metallurgical blast cupolas; electric arc and induction furnaces, with emphasis on improvements during past ten years. (W18d, W18s, W18a, 1-2)

337-W. (Italian.) **Study of the Behavior of Ingot Molds in Service.** Mario Cetin. *Fonderia Italiana,* v. 6, May 1957, p. 193-200.

Conditions of use and effects on life of molds; design and casting defects; specific consumption of molds. 7 ref. (W19c, S21)

338-W. (Italian.) **Use of Special Types of Synthetic Resins in the Construction of Patterns and Core Boxes.** Enrico Balocco. *Fonderia Italiana,* v. 6, May 1957, p. 209-214.

Types of resins used in foundry accessories; suggestions for construction of such accessories; service life and cost comparison with metal items. (W19m; 1-2; NM-d)

339-W. (Polish.) **The Gas Turbine as a New Power Source in Metallurgy.** Kamil Czwiertnia. *Hutnik,* v. 24, Jan. 1957, p. 11-17.

Trends of gas turbine application in metallurgy; application to blower driving; gas turbine for production of hot blast; application for utilization of energy contained in outlet gases of blast furnaces fed with a blast under pressure. 15 ref. (W11m, 1-2)

340-W. (Russian.) **Conveyor Drier With Natural Recirculation.** L. M. Marienbach. *Liteinoe Proizvodstvo,* no. 1, Jan. 1957, p. 4-6.

Several plants for drying molds, utilizing recirculation of foundry hot gases. 4 ref. (W19k, 1-2)

341-W. (Russian.) **Continuous Process Cleaning Drum.** M. I. Uskov and N. G. Popov. *Liteinoe Proizvodstvo,* no. 1, Jan. 1957, p. 7.

Casting cleaning apparatus which processes the castings at 500-600° C. (W3b, 1-2, 5)

342-W. (Russian.) **Bench Sand Blowing Machine for Coremaking.** N. I. Durnev. *Liteinoe Proizvodstvo,* no. 4, Apr. 1957, p. 17-18.

Each machine serves two coremakers; one fills the reservoir with a five-component core material,

then blows it into the corebox; the other opens the box and piles the cores on the drying board. Thus, 1400 four-compartment coreboxes are filled in a single shift. At present the operation for filling the reservoir is being mechanized.
(W19h, 1-2)

X Instrumentation

Laboratory and Control Equipment

69-X. An Automatic System of Fuel Control. Donald R. Mathews. *Iron and Steel Engineer,* v. 34, May 1957, p. 82-88.

Installation at steel plant for the automatic control of fuel oil and coke oven gas fuels used for heating openhearth furnaces and soaking pits.
(X13f, W18r, 1-2; RM-k 30, RM-m 38)

70-X. Cascade Temperature Control System on a Billet Heating Furnace. Jack M. Hess. *Iron and Steel Engineer,* v. 34, May 1957, p. 132-140.

Electric cascade control system automatically adjusts furnace control set point of a two-zone continuous billet furnace to make allowances for various rates of material flow; installation details and problems solved by use of control system with automatic zone setting. (X9s, W20h, 1-2)

71-X. (German.) Control Engineering as Applied to Metallurgy. Helmut Krüger. *Neue Hütte,* v. 2, Feb-Mar. 1957, p. 103-111.

Design of control systems; central controls, measuring and control devices. Control systems for hot blast furnaces; three-zone pusher type furnaces; openhearth furnaces; electrode control in electric furnaces; control of oxygen; conveyer control in cold rolling mills. 12 ref.
(X general, 1-2)

72-X. Graphite Resistor High-Temperature Furnace. G. E. C. Installation at B. S. A. *Metallurgia,* v. 55, May 1957, p. 255-256.

Graphite resistor furnace capable of providing temperatures up to 3000° C. for a charge up to 9 in. in diameter and 12 in. high. (X24f)

73-X. Instrumentation for Galvanizing Control. *Steel,* v. 140, June 17, 1957, p. 112-116.

Recording gas pressure controller and temperature recorders for controlling furnaces and zinc temperature in continuous galvanizing line for mild steel strip.
(X9s, L16, 1-2; *Zn,* CN)

74-X. Dial Indicators Lower Gaging Costs. Stanley DeGroff. *Steel,* v. 140, June 17, 1957, p. 126-131.

Factors in setting tolerance, gage selection and gage design for mechanical gaging of metal parts.
(X20b, 1-2)

75-X. Atmosphere Control. Pt. 1. Wayne L. Besselman. *Steel,* v. 140, May 20, 1957, p. 138-142.

Working principles of dew point, carbon potential and gas analyzers used for maintaining continuous control of heat treating furnace atmospheres. (X7f, X7g, 1-2, J2k)

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METALLURGIST: Age 29, family, B.S. degree in physics, M.S. in metallurgy. Six years diversified experience in research and development, liaison, production and quality control, as well as teaching. Experienced in welding, brazing, X-ray diffraction, metallography, laboratory supervision, and the fabrication and production of nuclear fuel elements and control rods. Florida preferred, but will consider other locations. Box 9-50.

METALLURGIST: Age 31, married, two children. Seven years experience in heat treating, five as chief metallurgist and four in charge of heat treating as well at one of the ten largest shops for automotive transmissions in Europe with output of 10,000 tons heat treated parts a year. Wants to immigrate to U.S. and get position which leads to responsibility. Will be in U.S. in November when interviews can be arranged. Box 9-55.

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METALLURGICAL ENGINEER: B.S. degree, graduate studies in metallurgical engineering, age 28, married. Four years experience in nonferrous foundry research and light alloy development with emphasis on investment casting and shell molding. Desires responsible position in field of precision casting. East or Midwest preferred. Box 9-85.

RESEARCH METALLOGRAPHER: Good metallurgical background, ferrous and nonferrous. Thoroughly versed in photomicrography, with 13 years experience, including an individually developed technique for reproducing color images in print form in minimum time. Will consider relocating to make connection with firm where ability can be put to good use. Box 9-90.

METALLURGICAL LAB SUPERVISOR: Prefers Northeast. Age 28, married. Six years aircraft laboratory experience, including physical testing, metallographic and heat treating. Presently employed as laboratory supervisor in charge of destructive and nondestructive testing of incoming material and welds. Trained in testing most ferrous and nonferrous metals. Box 9-110.

METALLURGICAL ENGINEER: Professional. M.S. degree, age 30. Eight years production and supervisory experience in ferrous and nonferrous fields. Metal working, fabrication, heat treating, foundry. Proven ability for plant improvement and cost savings. Management training. Desires executive or managerial position, preferably New York City. Other location will be considered. Box 9-115.

... A Notable Coincidence

The Second World Metallurgical Congress

RULES FOR ENTRANTS

Exhibitors do not need to be members of the American Society for Metals.

Work which has appeared in previous metallographic exhibits held by the American Society for Metals is not acceptable.

Photographic prints should be mounted on stiff cardboard; maximum dimensions 14 by 18 in. (35 by 45 cm.). Heavy, solid frames are unacceptable.

Entries should carry a label on the face of the mount giving:

Classification of entry.

Material, etchant, magnification.

Any special information as desired.

The name, company affiliation and postal address of the exhibitor should be placed on the back of the mount.

Entrants living outside the U. S. A. should send their micros by first-class letter mail endorsed "Photo for Exhibition—May be Opened for Customs Inspection".

Exhibits must be delivered before Oct. 15, 1957, either by prepaid express, registered parcel post or first-class letter mail, addressed:

Metallographic Exhibit
American Society for Metals
7301 Euclid Ave.
Cleveland 3, Ohio, U.S.A.

FLASH! Grand Prize will be the "Francis F. Lucas Award for Excellence in Metallography" Valued at $500 and Endowed by Adolph E. Buehler

Entries Will Be Expected From All Over the World— —Display Your Best Work

CLASSIFICATION OF MICROS

(Optical and Electron)

Class 1. Irons and steels.
Class 2. Stainless steels and heat resisting alloys.
Class 3. Aluminum, magnesium, beryllium, titanium and their alloys.
Class 4. Copper, nickel, zinc, lead and their alloys.
Class 5. Uranium, plutonium, thorium, zirconium and reactor fuel and control elements.
Class 6. Metals and alloys not otherwise classified.
Class 7. Series showing transitions or changes during processing.
Class 8. Welds and other joining methods.
Class 9. Surface coatings and surface phenomena.
Class 10. Results by unconventional techniques (other than electron micrographs).
Class 11. Slags, inclusions, refractories, cermets and aggregates.
Class 12. Color prints in any of the above classes. (No transparencies accepted.)

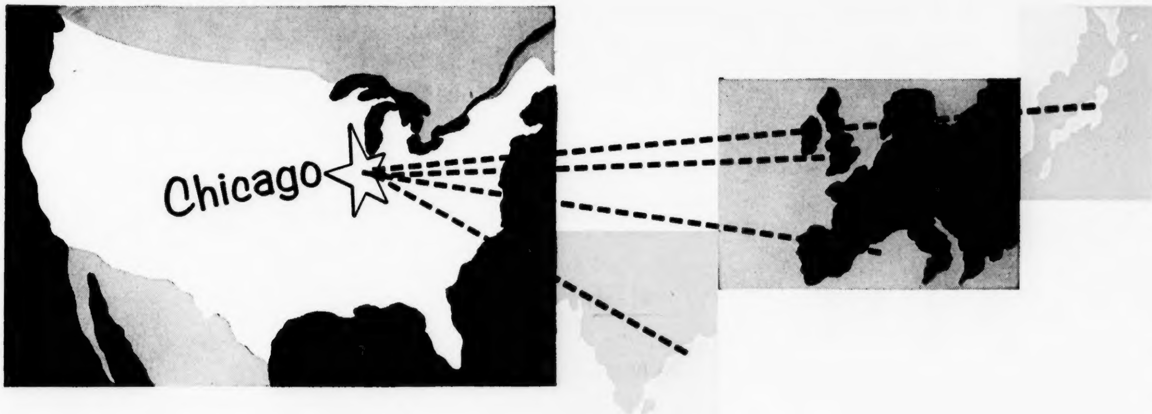
AWARDS AND OTHER INFORMATION

A committee of judges will be appointed by the Metal Congress management which will award a First Prize (a medal and blue ribbon) to the best in each classification. Honorable Mentions will also be awarded (with appropriate medals) to other photographs which, in the opinion of the judges, closely approach the winner in excellence. A Grand Prize, in the form of an engrossed certificate and a money award of $100, will also be awarded the exhibitor whose work is judged best in the show, and his exhibit shall become the property of the American Society for Metals for preservation and display in the Society's national headquarters in Cleveland.

All photographs may be retained by the Society for one year and placed in a traveling exhibit to the various Chapters. They will be returned to the owners in May 1958 if so desired.

The Twelfth Metallographic Exhibit

Chicago, Illinois, November 2 to 8, 1957



39th National Metal Exposition
2nd World Metallurgical Congress

In the whole, wide, wonderful world of metals, for one fast-moving, action-packed week, Chicago will be world headquarters for metal men.

From wherever metals are made . . . from wherever metals are used . . . from all parts of the United States and around the free world, the responsible men of metals will move into Chicago the week of November 4, 1957.

Engineers and scientists . . . executives and production experts . . . the responsible men of metals will be in Chicago to see the 39th National Metal Exposition — the best, the biggest, the most important Metal Show of them all. Hundreds of manufacturers will place their best products and operating processes and equipment on display in the vast International Amphitheatre and New Exposition Halls. This great Exposition will make show history . . . will make metals history.

And this is only half the story. World authorities on metals . . . outstanding scientists from the United States . . . again, the responsible men of metals will be speakers at the 2nd World Metallurgical Congress and at the 39th National Metal Congress. Technical and practical sessions will begin on Saturday, November 2, and run continuously through Friday, November 8. Never before has such an array of metals engineering and scientific talent been assembled on so vast a scale . . . engineering developments of world-wide impact will be presented for all to hear and digest and discuss.

You will want to attend this great event, this world metals week in Chicago. Your organization may well wish to send management, engineering and sales representatives. Make the first move now — write for hotel reservation forms.

AMERICAN SOCIETY FOR METALS

The Engineering Society for the Metal Industry

7301 Euclid Avenue — Cleveland 3, Ohio

Cooperating Societies: Metals Division, American Institute of Mining, Metallurgical and Petroleum Engineers . . . the Society for Non Destructive Testing . . . the Industrial Heating Equipment Association.

Exhibit Space Available

Hundreds of manufacturers have reserved Metal Show space, but there are good locations still available in the vast new exposition halls of the International Amphitheatre. If the metalproducing or metalworking industries are your market, don't miss this show — write for display information now.